# ANATOMY

OFTHE

# Humane Body

ABRIDG'D:

A Short and full View of all the PARTS of the BODY.

Together with
Their several Uses, drawn from their
Compositions and Structures.

By JAMES KEILL, M.D.

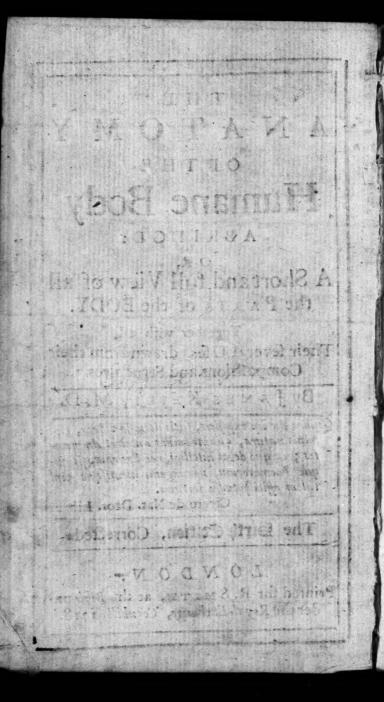
Quibus autem expositis, satis docuisse videor, Hominis natura, quanto omnes anteiret Animantes; ex quo debet intelligi, nec siguram, situmque Membrorum, nec ingenii mentisque vim talem essici potuisse fortuna.

Cicero de Nat. Deor. Lib. 2.

The Sirth Coition, Corrected.

LONDON:

Printed for R. SMITH, at the Bible under the Royal-Exchange, Cornbill, 1718.



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Emcourage me to it; and I

Very Learned and Ingenious

# Edward

Doctor of Phylick, Fellow of the College of Physicians, and of the Royal Society, Physician to Bethlem-Hofpital,,

#### AND

Lecturer of ANATOMY at the Surgeons-Hall in LONDON.

dantly demonstrated, Ryl & Would scarce bave adventured the Publishing of the following Sheets, if, after a particular and care-

# The Epistle

sareful Perusal, you had not been pleased to Advise and Encourage me to it; and I desire the Favour of presixing your Name to them, that the World may know your Approbation, which will sufficiently secure me from Censure, and recommend them, as containing something Exact and The-

a

ful: For Your Skill and Judgment in this Subject is well known, and abundantly demonstrated by those Treatises with which you have obliged the World, and the Publick Lectures, by which you have adorned the

# **PEDICATORXIT**

the Honourable and Useful Office you have held for several Years.

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ed be But yet I am not so Vain as to think there are no Slips nor Errors in this little Treatise, nor will I impose so sar upon your Goodness and Civility, as to expect your Patronage of them: I only hope, that after your Example, others will be so Candid and Civil, as to pass them over.

I do also readily accept of this Occasion, to pay my most hearty Acknowledgments A 3 for

# The Epistle, &c.

for your private Favours and Civilities. And as I have a true Esteem for your Merits, so I shall be always ready to bew my self,

Your most Humble and

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ABRIDG'D.

Of the Component, External, and Common Parts of the Body sees to first course are

#### e Cartilagee, ani - Atania S E C T. L. Animara

Of the Component Parts.

Purposely passover the various Definitions of a Part, as being of no great Ufe; and for the same reason I will not trouble the Reader with the several Divisions which Anatomists make of the Parts of the Humane Bo- All the dy. It is sufficient to know, that all Parts are the Parts are made up of Threads or made up of

Fi- Fibres.

Of the Component Parts.

Fibres, of which there be different kinds; for there are some soft, flexible, and a little elastick; and these are either hollow, like fmall Pipes, or fpongious, and full of little Cells, as the nervous and fleshy Fibres; others there are more folid and flexible, but with a ftrong Elasticity or Spring, as the Membranous and Cartilaginous Fibres; and a third fort are hard and inflexible, as the Fibres of the Bones. Now of all thefe, some are very sensible, and others are destitute of all Sense; some fo very small as not to be easily perceived; and others, on the contrary, fo big as to be plainly feen. And most of them, when examined with a Microscope, appear to be composed of still imaller Fibresiat to the town

Now these Fibres do first constitute the Substance of the Bones, Cartilages, Ligaments, Membranes, Nerves, Veins, Arteries and Muscles. And again, by the various Texture, and different Combination of some or all these Paris, the more compound Organs are framed; fuch as the Lungs, Stomach, Liver, Legs and Arms, the Sum of all which make up the Body. active (1 , 5 %) and

#### SECT. I.

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Of the External Parts.

THE Body is divided into four prin- The Divicipal Parts, which are, the Head, the fion of the Thorax, the Abdomen, and the Extre-Body.

mities, viz. the Arms and Legs.

The External Parts of the Head or The Exter-Upper Cavity, are, the Face, and the nal Parts Calva or Hairy Scalp. The Parts of the of the Face, are, the Brow, the Ears, the Eyes, Head. the Cheeks, the Nofe, the Philtrum and its fides, the Mustaches, the Lips, the Mouth, and the Chin. The Parts of the hairy Scalp, are, the Sinciput, or Forehead, under which lieth the Os Frontis: It reaches to the Beifuz, or meeting of the Coronal with the Sagittal Suture. The Vertex, or Crown of the Head, is where the Hairs turn, as it were, round a Point; and from thence to the first Joint of the Neck is the Occuput or Hindhead. The Temples or the Sides of the Hairy Scalp, under which are the Crotaphite Muscles, the Offa Petrofa; they reach to the Suture Squamofe.

The External Ear is divided into two Of the Ear.
Parts, of which the upper is called Pinna, or the Wing; the lower Fibra, or

Lobe. The Parts of the Pinna are the

Of the External Parts.

Helix, which is the outward Circle or Border of the Ear; the Anti-helix, which is the Semi-circle within the other: The lower End of the Semi-circle makes a little Prominence, which is called Antitragus; because there is another Prominence just opposite to it, which is call'd Tragus, by reason of some Hair that is upon it. The Cavity made by the Extremities of the Helix and Anti-helix is call'd Concha: The Hollow in the Middle of the Ear is called Alvearium, it has a Hole which leads to the Tympanum, named the Meatus Auditorius.

Of the Eyes.

The External Parts of the Eyes, are the Supercilia or Eye-brows, the Canthus Internus, or the Great Angle, where the Caruncula Lachrymalis is; the Canthus Externus, or the Little Angle, which is the furthest from the Nose; the Palpebre, or the Upper and Lower Eye-Lids; the Cilia, which are little Cartilages on the Edge of the Eye-Lids; the Hairs planted upon the Cilia in Form of a Pallizado; the Puneta Lachrymalia, which are two little Holes near the big Angle of the Eye. The Orbite is a Cavity made by the Bones, in which the Globe of the Eye is contained, with its fix Muscles; the Tunica Conjunctiva, which is the White of the Eye; the Cornea, which

Of the External Parts.

which is the transparent Part of the Eye; the Iris or Rain-bow, in the Middle of which is the Pupilla or Sight.

The Nose has its Spina or Ridge; Of the which is long. The Acrorimion, which Note, Lip. is Cartilaginous, and reaches from the &c. End of the Spine to the Globulus or Tip of the Nofe. The Nostrils are the Passages into the Nose. The Ale or Wings of the Nole are the Sides of the Nostrils. The Columna is the little fleshy Portion which reaches from the Tip of the Nose to the Philtrum; it divides the Nostrils. The Philtrum is the Hollow which divides the Upper Lip immediately under the Noie. The Cheeks reach from the lower Eye-lids: to the Lips. The Mentum or Chin is the Fore-part of the lower Jaw. The lower Jaw reaches from the two Ears to the Chin inclusively. The Lips are the musculous Flesh at the Entry of the Mouth; their external Part is called Prolabium, and that which is tinctured red, Prostomion. The Gums are the Flesh which covers the lower part of the Teeth will no white the the commence

The Neck reaches from the Head to Of the the Clavicula or Channel Bones. Its Neck. Parts are the Juzulum or Throat, which is its Fore-part, along which descends the Trachea Arteria or Wind pipe, and

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the Oesophagus or Gullet. The Eminence which appears in the upper Part of the Throat is called Pomum Adami. The Cervix, which is the hind Part of the Neck; its upper Part is call'd Lophia, the middle Fossa, and the lower Epomis. The Parotides make the upper and lateral Part of the Neck, Tertbra the middle, and Paralophia the lower.

ernal arts of be Thoax or Middle azity.

of the Ex- All that lies betwirt the Bafis of the Neck and the Diaphragma or Midriff, that is, down to the last Ribs, is called the Thorax or Chest. The Fore-part of the Thorax is call'd the Breaft; in it are the Clavicula or Chanel-Bones: and the Sternum or Breast-bone, which is in the middle: it begins at the Clavicule, and terminates in the Cartilago-Xiphoides or Sword-like Cartilage. Under the Sternum lies the Mediastinum, and the Heart in its Pericardium. The Mamme or Breasts are two round Tumours which appear upon the Fore-part of the Cheft, under which are fituated Part of the Ribs, the Pleura, and the Lungs: There flands upon their Centre a little Protuberance, called Papilla or Nipple, which is encompassed with a reddish Circle, call'd Arola. The Hollow in the Middle of the Breaft, below the Breafts, is called Scrobiculus Cordis. The hinder Part of the Thorax is call d the Back,

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composed of Twelve Veruebra or Joints, and Two Scapula or Shoulder-Blades, which are the two upper Parts of the Back on the Sides of the Vertebra. The lateral Parts of the Thorax are call'd Peristerna.

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The Lower Belly extendeth from the Of the Ex-Cartilago Xiphoides to the Os Pubis; the ternal fore-part is call'd Abdomen, and the Parts of hinder-part the Back-fide. The Abdo- the Abdomen is divided into Upper, Middle, and men or Lower Parts. The Upper reaches from Lower the Cartilago Xipboides, till within two Belly. Fingers breadth above the Navel; it is call'd Epigastrium, and its two Sides Hypochendria : The Right covers the greatest part of the Liver; the Left the Spleen, part of the Stomach, and Colon. The Middle Part of the Abdomen is only two Fingers breadth above, and as much below the Navel; it is call'd Regio Umbilicalis; its middle is call'd Umbilieus or Navel. Under the middle of this Region lies all the Intestinum Jejunum, and part of the Ileum. The Sides of this Region are called by Gliffon, Epicolibecause they cover the Colons Un der the Right is contain'd the Right Kidney, part of the Colon and Seit- to num: Under the Left is contain'd the Left Kidney, with part of the Coloranda. Jejumin The lower part of the white-

men reaches from the Umbilical Region, to the lower part of the Os Pubis it is call'd the Hypogastrium; it covers the Bladder, Womb, and the Redum or Straight-Gut. The lower part of the Hypogastrium is called Petten, or Regio Pubis; its fides Inquina or Groins. The fides of the Hypogastrium are call'd Hia, either because they contain almost all the Gut Ilium, or because they terminate at the lower part of the Os Hium. The Inguina or Groins are below the Ilia, where there is a part of the Muscle Cremafter, with the Productions of the Peritoncum. The hind part of the Abdomenis call'd the Back-fide guirreaches from the last Ribs to the Extremity of the Os Sacrum. It is divided into two Parts. The upper is call'dithe Small of the Back, its fides the Loins; the Middle of the lower part is call'd Radings as its lower End is the Anso, and its fides the Nates or Buttocks. The Per rinaum is the Space between the Anus and the Scrotum in Men, and the Vulva this Region are called by Connaw ni

Of the ExThe External Parts of Generation
ternal proper to Men are the Yard and the
Parts of Screen. The Extremity of the Yard is
Generaticall'd the Glans: The Prapatium or Foreon in Men. It is the Skin doubled which covere the

Glandike a Hood. The Frenum or Bridle

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dle is a little whitish colour'd Ligament which ties the Fore-skin and the Glans together beneath. The Edge of the Glans where the Praputium begins, is call'd Corona or Crown. The Urethra is the Canal which runs along the under fide of the Yard, thro' which the Seed and the Urine pass. The Rapba or Ridge, is a Line, which running along the under fide of the Yard, divides the Scrotum and Perinaum in two; its Length is from the Franum to the Anus. It is not ordinarily cut in the Operation for the Stone; first, because it's harder than any other part of the Skin there, and then cutting upon the Interstices of the Muscles, the Sides of the Wound do not fo easily unite. The Scrotum is the Purse which contains the two Testicles.

The External Parts of Generation Of the Exproper to Women, are the Vulva or ternal great Chink fituated below the Os Fu-Parts of bis, and covered with Hair; above this, Generation there is a little Swelling made by some in Women. Fat under the Skin, which is call'd Mons Veneris. The Labia or Lips of the great Chink are only the Skin swell'd by some Fat underneath; these being a little separated, there appear the Nymphis, one on each side of the Chink; they are two small Pieces of Flesh resembling the B; Mem-

Membranes that hang under the Throats of Pullets. In the Angle of the great Chink next the Os Pubis, is the Extremity of the Clitoris, covered with a little Hood of the Skin call'd Praputium. A little deeper, in the fame side of the Vulva, there is a little Hole, which is the Orisice of the Neck of the Bladder. On the opposite side, next the Anus, are Glandula Myrtisormes, situated in the Fossa Magna or Navicularis, and in this Angle of the Chink there is a Ligament called the Fork, which is torn in the first Birth.

Of the External Parts of the Arms, Fore-Arms and Hands.

The Arm is from the Joint of the Shoulder to the Elbow, which is the Place where we bend our Arm. The Fore-Arm is from the Elbow to the Wrist or Carpus. The Hand is all that which is betwixt the Wrist and the Ends of the Fingers. The Parts of the Hand are the M.tacarpus, which is from the Wrist to the Root of the Fingers; the outside which is the Back of the Hand; and the Infide, which is the Palm of the Hand; the Mons Pollicis is the fleshy part of the Hand nigh the Thumb; the Finger next the Thumb is call'd the Index or Fore-finger, then follows the Middle, the Ring-Finger, and the Little one. Upon the Extremities of the Fingers are the Nails; the white Spot which is at the

Of the Cuticula.

the Root of the Nails is called Onyx.

The Thigh is from the Haunch to Of the Exthat Joint of which the Fore-part is ternal call'd the Knee; the Back-part the Parts of Ham. the Thigh

The Leg is from the Knee to the Tar- and Leg. Jus; its Fore-part is call'd the Shin, and the Back-part the Calf of the Leg: The Eminencies which are at the Extremity nigh the Tarfus, are called the outer and inner Ankles of the Foot: The Tarfus is from the Ankles to the Metatarfus, or breadth of the Foot, which goes to the Root of the Toes: The upper Part of the Foot is call'd instep; the under Part the Sole of the Foot: the Toes are Five in Number, with their Nails.

# to much a \$ E C T. III.

Of the common Parts or Teguments,

Of the Epidermis or Cuticula.

THE first and outermost Covering of the Body is the Cuticula or Scarf-Skin, by the Greeks called Entities. This is that soft Skin which rises in a Blister upon any Burning, or the Application of a Blistering Plaister. It slicks close to the Surface of the true Skin.

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Of the Cuticula.

Skin, to which it is also fied by the Veffels which nourish it, though they are so small as not to be seen. When we examine the Scarf-skin with a Microscope, it appears to be made up of feveral Lays of exceeding small Scales, which cover one another, more or less, according to the different Thickness of the Scarf-skin in the feveral Parts of the Body. In the Lips, where the Scales appear plainest, because the Skin is thinneil, they only, in a manner, touch one another. Now these Scales are either the Excretory Ducts of the Glands of the true Skin, as, I think, is apparent in Fishes, or else these Glands have their Pipes opening between the Scales. Lewenbook reckons, that in one Cuticular Scale there may be five hundred Excretory Chanels, and that a Grain of Sand will cover two hundred and fifty Scales; fo that one Grain of Sand will cover one hundred twenty five thoufand Orifices through which we daily perspire.

The Scales are often glewed to one another by the groffer Parts of our infensible Transpiration, hardening upon them by the Heat of our Body, which carries off the more volatile Particles. The Humour which is afterwards feparated by the Glands of the Skin, being

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pent in between the Scales, causes frequent Itchings; and where the Marter has been long pent up, small Pimples; for the removing of which, Nature directs us to those wholsome Remedies of frequent Rubbing, and Washing or Bathing.

The Use of the Scarf-skin is to defend the Nerves of the Skin, which are the Origine of the Sense of Feeling, from the Injuries of rough and hard Bodies, as well as the Air; for either those would make too exquisite and painful an Impression upon the naked Nerves; or the Air would dry them, so as that they would be less susceptible of the nicer Touches of Pleasure.

#### SECTAIV. El doure

Of the Skin. Tuban tes

WE remark in the Skin, the Scarf-The Parts skin being raised, Three Parts of the The First is, an infinite Number of Pa-Skin. pilla Pyramidales; they are the Ends of all the Nerves of the Skin, each of which are enclosed in two or three Covers of a Pyramidal Figure, and these Covers are each above another. They may be eafily seen and separated in the Skin of an Elephant, and in the Skin of the Feet

14

Feet of feveral other Animals. Between these Papilla are an infinite Number of Holes, which are the Orifices of the Excretory Vessels of the Miliary Glands underneath. About the Papilla is spread a Mucous Substance, which because it is pierced by them, and consequently full of little Holes, is called by Malpigbins the Corpus Reticulare; its Use is, to keep the Extremities of the Nerves foft and moift, and fensible of the flightest Touches. The Second Part is a Web of Nervous Fibres, and other Veffels differently interwoven, and it is the Parenchima or that Part of the Skin that the Parchment is made of. The Third Part is an infinite Number of Miliary Glands, about which there is much Fat; they lie under the other two Parts, they separate the Matter of Sweat and insensible Transpiration. Each Gland receives a Nerve and Artery, and fends out a Vein and Excretory Veffel, which last passes through the other two Parts to the Cuticula, for the discharging the Body of this Matter. and for the moistening the Cuticula and the Papilla Pyramidales, that they may not dry, which would very much hurt the Sense of Touching. Upon the Surface of the Skin there are many Parallel Lines, which are cut by as many Parallel

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el ones. These Intersections make spaces of a Rhomboidal Figure; and out of each Angle, for the greatest part, grows a Hair shorter or longer, as Nature requires in the several Parts of the Body; but in the Palm of the Hand, where there are no Hairs, these Lines to not intersect one another, and on the Ends of the Fingers they are spiral.

The Skin is fix times thicker than the The Thicke Scarf-skin: And in the Sole of the Foot nels of the it is much thicker than in the Face Skin. Hands, and other Parts. In the Summer it is fofter, because the Pores are wider. In the Winter it is more compact and harder, because the Pores are more close; therefore the Hairs of Beafts flick faster, and Furs made of them are better in that Season. In some the Skin is white, in others black and tauny, which probably comes from the different Colours of the Mucofity which covers the Parenchima of the Skin; for the Fibres of the Skin in all are white, and there is little or no Difference in the Colour of different Bloods.

The Skin is not only a Covering in The Use which all the Parts of the Body are of the wrapt up, but in it also Nature has pla-Skin. ced the Organs of the Sense of Feeling, so that not the least thing hurtful can assault us without our Knowledge. And

of it preserves us from external Offences, so it relieves us of noxious and superfluous internal Humours, its Glands being the Emunctories of the whole Body, through which not only the peccant Humours pals, but likewise the greatest part of the Liquors which we drink; which having part of their Office in conveying the Aliments into the Blood, are in the next place, to diffolve the Saline and Terrefirial Particles to be carry'd off through the Glands of the Skin and

Kidneys.

Now the Sum of all these Particles ftrain'd through the Cuticular Glands, is by Sanctorius reckon'd to amount to about fifty Ounces a Day in Italy: So that suppose a Man's Body to weigh 160 Ponnds, then in 5r Days we perspire a Quantity equal to the Weight of the whole Body. And from the Confideration of this and other Evacuations, our Bodies are said to be renewed and changed in some stated Times; but that the Vessels or folid Parts of the Body do constantly decay, waste, and evaporate, does not at all to me feem probable; nor if they do, is it possible to determine in what Time there is a total Change; and I am more apt to think, that the Fluids only consume, of which tho' feveral Pounds are daily loft, yet

Of the Hair.

t is not from thence certain when the old Stock is spent, and the Veffels fill'd with new Juices; for besides that the frue quantity of Blood in the Body is not certainly known, we can never be fure whether they be new or old Juices, or a Mixture of both, which are con-Stantly flying off; and if a Mixture, which is most probable, in what proporion they are mix'd, which must necesfarily be known in order to determine when the old Mass is entirely evacuated. But that fome of our native Blood does remain in the Body even to the last Stages of Life, feems credible from hence, that fome have fillen into the Small Pox at 80 and 90 Years of Age. none, in a certain, there inch Cauleria,

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THE Hair may justly be reckon'd one of the common Teguments of the Body, not only for its Use, but also because it is to be found upon all the Parts of the Body except the Soles of the Feet, and Palms of the Hands. It grows longest upon the Head, Beard, in the Armpits, and about the Privities. When we examine the Hairs with a Microscope, we find that they have each a round

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round bulbous Root, which lies pretty deep in the Skin, and which drawstheir Nourishment from the surrounding Humours; that each Hair confifts of five or fix others wrapt up in a common Tegument or Tube. They grow as the Nails do, each part near the Root thrusting forward that which is immediately above it, and not by any Liquor running along the Hair in Tubes, as Plants grow. Their different Colours depend much upon the different Temperaments and Quality of the Humours that nourish them. The Use of the Hairs is for a Covering and Ornament to the Body. Whatfoever the Efficient Caufe may be why a Man has a Beard, and a Woman none, it is certain, the Final Cause is, for the diftinguishing the Male from the Female Sex, which otherwife could hardly be known if both were dress'd in the fame Habit.

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Rody not ones for its Cinciparation beerral so la n Of the Fat. so orei il stess

of the Body except the Soles of the Feet, UNderneath the Skin there lies a Membrane call'd the Membrana Adiposa, which by the help of a Microscope, appears to be composed of an infinite Number of fine transparent, Vefi-PAROL

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es or Bladders, into which the Bloodeffels that are spread upon them deofite the oily and fulphureous Part of he Blood, which in these membranous Cells we call Fat.

Malpighius mentions a Net of small The Veffels effels, which he calls Dudus Adipofi, of the Fat ecause they are full of Fat; these he appofes bring the Fat into the Cells; but he could never discover from whence hey take their Rife. There are also a Number of little Glands, which are acimpanied with Lymphatick Veffels, which carry back any Serofity that is uperfluous.

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The Fat is to be found immediately under the Skin, in all the Parts of the ody, except in the Fore-head, Eyeds, Lips, upper part of the Ear, Yard, d Scrotum. In some the Veficles of e Membrana Adiposa are so full, that e Fat is an Inch or more thick, and in hers they are almost flat, containing tle or no Fat. There are two forts of Two Sorts at, one white, or rather yellow, foft of Fat. d lax, which is eafily melted, call'd eguedo; another white, firm, brittle, d which is not eafily melted, call'd oum or Tallow. Some reckon the arrow of the Bones for a third fort of turbus and substitute such asking the Phickeds and management best sh

The

Of the Membrana Adipofa, &c.

The Use of The chief Use of the Fat is to blun the Fat. and fweeten the too great Sharpness and Acrimony of the Salts which are in the Blood. It serves also to moisten and fupple the Parts, for facilitating their Motion; to fill up the Interstices of the Parts, that the Skin may be smooth and beautiful; to defend the Body against external Cold; and, in fine, to hinder too great a Diffipation of the Spirits.

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#### SECT. VII.

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Of the Membrana Adipola, Carnola Com munis, and Propria Musculorum.

Membrane is a Web of feveral forts Membrane 1 of Fibres interwoven, for the covering and wrapping up of some Parts Their Membranous Fibres give them an Elasticity, whereby they can contract and closely grafp the Parts they contain, and their Nervous Fibres give them an exquisite Sense, which is the Cause of their Contraction; therefore they can fcarcely fuffer the Sharpnels of Medicines, and they are difficultly united, when wounded. In their Texture there area Number of small Glands, which separate an Humour fit for moistening the Parts which they contain. By reason of the Thickness and Transparency of the MemOf the Membrana Adipola, &c.

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blun embranes, the Ramification of the Is and ood Vessels are more apparently to be in the en in them, than in any other part of n and e Body; here the innumerable Divifitheir s, Windings and Turnings, Serpenof the e Progressions, and frequent Inoscuth and tions, not only of Veins and Arteries gainst gether, but also of Veins with Veins, ninder d Arteries with Arteries, make a most reeable Embroidery and delicate Netork covering the whole Membrane. or is Nature always conflant to the me Disposition, but delights in Variehere, as well as in the Disposition of le Branches and Leaves of Plants and rees. Those that cover the folid Parts, A diffin-1 forts e properly call'd Membranes; and gion of coveey have their particular Names, as the Mem-Parts eritoneum, which wraps up all that is branes. em an ontained in the Abdomen; the Pleura ntract hat which is in the Thorax; the Periontain eum the Bones, and the Pericardium ne Heart. Those which form the Coats em an use of Vessels, and which contain the Huy can ours, as those of the Veins, Arteries, Meditomach, Bladder, Intestines, Testicles, nited, c. are call'd Tunicles or Coats: And there ofe which cover and embrace the ch serain, as the Dura, and the Pia Mater, g the e call'd Meninges. Of all those kinds on of Membranes, some are thin, and some f the e thick; and the same Membrane is

thick

thick in fome places, and thin in other places, as in the Membrana Adipofa, which is thicker in the Neck than in any other

the Membranes.

The Use of part of the Body. The Use of the the Mem- Meinbranes is to cover and wrap up the Parts; to ftrengthen them; to fave then from external Injuries; to preferve th Natural Heat; to join one Part to ano ther; to fustain small Vessels, and the Nerves which run through their Dupli catures; to stop the returning of th Humours in their Veffels, as the Valve flop the returning of the Blood in the Veins and Heart; of the Chyle in the Lacteals and Thoracick Duct; and o the Lympha in the Lymphatick Vessels.

The Membrana Adipofa and Carnofa.

By the Membrana Adipofa, is most com monly understood that part of it only which lies next the Flesh, and which contains but little Fat in its Cells; and therefore appearing more Membranou than the rest, is faid to be the Basis the Cellula Adipola. And even fome par of this hath been taken by Anatomia for the Membrana Carnofa, upon the ac count of its Redness; for here the Bloo Vessels lie very thick, the Vesicles no being diften led with Far.

Of the Membrana Communis Musculotum.

Anatomists do generally affert, Thi there is a Membrana Communis Musca lorum, being led into that Mistake by the Aponeurasis of several Muscles; whereas

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Of the Muscles in General.

on stricter Observation, there is no ch thing to be found. The Membrana Of the opria Mufculorum is that which covers Membranmediately all and every one of the na Proibres of a Muscle, and is closely tack'd pria Musthem. There is another call'd Mem-culorum. ana Communis Vafoulorum, which is a in Membrane, and accompanies al-Membra-oft all the Veffels of the Body. All Membra-efe Membranes receive Veins, Arte-munis es and Nerves from the Parts which Vasculoe nearest to them.

CHAP. II. Of the Lower Belly.

SECTAL Design and L Of the Muscles in General.

Muscle is a Bundle of fleshy and The Defioften tendinous Fibres, of which nition of a all in the same Plane are Paral- Muscle. to one another, and they are all ens'd by one proper Membrane. The Of the eshy Fibres compose that Part which Fleshy Ficall'd the Body or Belly of the Muscle; bres. ey are red, lax, and spongious, conning a Number of finall Cavities, they e tied together by a number of small and

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and shore Threads, which go from Fibre to Fibre, call'd Membranous Fibres. Of the Tendinous Fibres compose the two Tendinous Extremities; they are call'd Head and Fibres. Tail, or the two Tendons of the Mufcle; they are white, hard, compact, and closely bound together, which make them less than the Body of the Muscles In every Tendon there are as many ten dinous Fibres, as there are fleshy Fibre in the Body of the Muscle ; fo that eve ry fleshy Fibre answers at both Ends to a tendinous Fibre, to which they are all ways join'd obliquely, making equal and alternative Angles.

The Divi-Gon of Muscles.

Muscles are either Simple or Com posed: The Simple have all their Fi bres Parallel, and in the same Direction The Composed have the fleshy Fibre of feveral Planes croffing one another or of different Directions, and they may be divided into as many Simple Muscle as there are Planes, whose Fibres have different Directions. Each Plane resembles a Rhomboides or Lozenge. Strength of a Muscle consists in the Number of its Fibres. The Tendon are fometimes double and triple, as the Biceps and Triceps. Sometimes feveral Muscles join in one Tendon, as the Ten do Achillis. Sometimes one Muscle has two Belli e, as the Digastricus. W

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Ribre We find also Muscles without Tenons, as the Quadratus of the Fore-Arm, ibres. nd several of the Face, Tongue, and e two Lower Jaw; and they are only inferted d and nto the Periosteum: Whereas those that e Mu ave Tendons are inferted into the Bot, and y of the Bone. There are others which make ave only Tendons at one end, as may fcles e feen in the Myology. This makes y ten me suspect that Tendons are only for Fibre he Conveniency of having a great numt eve er of Fibres inferted about a small nds to one. Those who would have a more are al particular Description of a Muscle, may ial and onfult Steno and Borelli.

Each Muscle, and every Fibre in a luscle has Nerves, Veins and Arteries, ther of which being tied, deprives the uscle of the Power of contracting; it the Stoppage being removed, they ntract again, and contracting swell, that the Action of the Muscles is perrmed by the Rarefaction of the Blood d Spirits distending the Cavities of

e Fibres.

This Rarefaction of the Blood and pirits, we suppose to be performed after is manner. The Blood is full of Gloales of Air strongly compressed by the rrounding Particles of Blood attracng one another, which therefore form Globule or Shell of Blood, in the

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middle of which is a small Globule of Air, whose Force of Expansion will be always proportional to the Force by which it is compressed. These Globules continually circulating through the Cavities of the Muscular Fibres, and mixt with the Animal Spirits, which at our Will and Direction drop from the Nerves into the Cells of the Fibres, and attracting the Particles of the Blood more strongly than they do another give the enclosed Air an Opportunit of expanding it felf, and confequently of swelling the Vesicle, and each Ve ficle swelling at the same time, the whole Fibre must be shortned, and the Shortening of all the Fibres, is the Contraction of the Muscle.

Tho' the Contraction of the Fibre be confiderable, yet the Swelling fcarcely fenfible, by reason of the Small ness of the Cavities of the Fibres. For each Fibre resembles a String of Bladders, each of which being blown us singly, will raise a Weight to some determined Height; and if the who String of similar and equal Bladders blown up together, the Space through which the Weight will rise will be proportional to the Number of Bladder or Length of the String or Fibre of the Muscle. Now, tho' the Swelling of

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Of the Muscles of the Lower Belly. ule of rge Bladder required to raife a Weight vill be fome confiderable Height must be ce by ery great, yet several small Bladders Flobuill do the fame Thing with a Force the the nd Swelling less in any given Propors, are on. For suppose a Bladder, of a denich at rmined Bigness can raise a Weight a m the bot, a hundred Bladders, whose Diais, and etersare each to the former Blood ing blown up, will raise the Weight nother the same Height, but the Force of rtunii flation, and the Swelling of all put touent ther, will be 1000 times less than in ch Ve e large one, and thus we see how e, th echanically the Structure of the Fiand the es contributes to the Contraction of is the e Muscles, with a very inconfiderae Force, and a Swelling almost im-Fibre

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T Aving raifed the Skin and Fat, the Muscles of the Lower Belly apar, which are five Pair in number: he first of which that presents it self, the Obliquus Externus or Descendens ; Obliquus takes its Origination from the two Externus. ft true, and the five false Ribs, by five fix Digitations, the four uppermost aris

Of the Muscles of the Lower Belly. of which lie between the Teeth of the Serratus Anticus Major; its Fibres, de fcending obliquely, are inferted all a long the Linea Alba under the Muscul Relli, to the upper and fore-part of the Spine of the Ilium, and to the fore-part of the Os Pubis. It has a large Aponeu rosis, or tendinous Expansion, which covers both it felf, and the Muscul Relli. The Linea Alba is a Line which reaches betwixt the Cartilago Xiphoid and the Os Pubis, made by the Unio of the Tendons of the Oblique an Transverse Muscles, dividing the A domen in two in the middle. Thi Muscle receives a Twig of a Nerve from the Intercostals at each of its Digitat ons.

Obliquus Internus. The Second Pair is the Obliquus A cendens or Internus, whose Fibres ar disposed in a contrary manner, crossin the former obliquely; they arise wit a large and fleshy Beginning, from the Circumference of the Ilium, from the Cartilaginous Part of the False Rib and they are inserted all along the Lim Alba.

Transver-

The Third Pair is the Transversals it lies under the two former; it arise from the Cartilago Xiphoides, from the Extremities of the False Ribs, from the

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Of the Muscles of the Lower Belly.

ansverse Apophyses of the Vertebræ of he Loins; it is fixed to the inner fide f the Spine of the Ilium, and is infert-

d in the Os Pubis, and Linea Alba.

These Three Muscles unite their endons as they approach the Linea Ai-; they are pierced in the middle of e Linea Alba, for the Passage of the Imbilical Vessels. They are also pierd above the Os Pubis, for the Passage the Spermatick Vessels in Men, and e round Ligaments of the Womb in omen. These Holes are not opposed one another; that which is in the tansversal is highest, that in the Oblius Ascendens is a little lower, and at in the Obliquus Descendens lowest. is this last which is only cut in the peration of the Bubonocele; it has a he and thin Membrane that closes exfly its Ring or Hole, through which re Vessels pass.

The Fourth Pair, which is covered ith the Aponeurosis of the Obliqui, is he Musculus Redlus, it arises from the Rellus. ternum, the Extremity of the last two ue Ribs, and goes strait down the prepart of the Abdomen to be inserted n the Os Pubis. This Muscle has three r four Innervations, or rather tendiious Coarctations of its fleshy Fibres, which divide the Belly of this Muscle,

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as it were into fo many distinct Muscles. It has Veins and Arteries, which creep on its infide, from the Mammillary and the Epigastrick Vessels, which communicate, that the Blood may return by the Mammillary Veins, when the Passage is stopt by the Epigastrick, which are compressed in Women big with Child.

lis.

Pyramida- The Fifth Pair is the Pyramidalis, fo called because of their Figure, they rise with a fleshy Beginning, from the outer and upper part of the Os Pubis, and growing narrower and narrower, are inferted in the Linea Alba, sometimes near to the Navel. Sometimes one, and fometimes both of these Muscles are wanting.

The Ule of thefe Muscles.

The Use of these Muscles is, to compressall the Parts contained in the Abdomen, by which Compression, the Motion of the feveral Fluids thro' their Vessels in general, is promoted, and particularly that of the Chyle through the Lacteal Vessels; the Stomach discharges it felf in Vomiting of what is offensive to it, and the Restum of the Excrements it contains; in Expiration the Ascension of the Midriff, and Decension of the Ribs by the Oblique Muscles are facilitated; the Diffension of the Intestines beyond their natural Tone is prevented:

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for without this Compression upon the Intestines, the Air in their Cavity being rarised by the Heat of the Body, must have stretched them to such a Degree, as to have stopt both their Peritaltick Motion, and the Circulation of the Blood in their Vessels. By their Contraction the Trunk of the Body is bent forwards, and by the Contrivance of their Fibres decussating one another, every Point of the Lower Belly is sufficiently compress'd, so as that the Intestines can slip no where from the Compression.

### SECT. III. Janow

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### Of the Peritonæum.

Immediately under the Muscles of the Its De-Lower Belly appears the Peritonaum scription. It is a thin and soft Membrane, which encloses all the Bowels contained in the Lower Belly, covering all the Inside of its Cavity. Its External Superficies is unequal where it adheres to the Transverse Muscles. The Internal is very smooth and polish'd. It has a number of small Glands that separate a Liquor which supples the Intestines, and facilitates their Motion. When these Glands are obstructed, the Peritonaum grows

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Of the Peritonaum.

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thick, as may be feen in feveral Drop-

The upper part of this Membrane covers the Midriff, to which it closely adheres; the forepart of it sticks to the Transverse Muscles, and Linea Alba; the lower part of it to the Os Pubis; and the back part of it to the Os Sacrum, and Vertebra of the Loins. 'Tis a double Membrane, and contains in its Duplicatures the Umbilical Vessels, the Bladder, the Ureters, the Kidneys, and the Spermatick Vessels, to all which it gives a Membrane, as also to the Liver, Spleen, Stomach, Intestines, and Womb.

Its Pro-

Its External Lamina has two Productions, like to two Sheaths, which pass through the Rings of the Oblique and Transverse Muscles in the Groin, for the Passage of the Spermatick Vessels in Men, and for the round Ligaments of the Womb in Women. These Productions being come to the Testicles in Men, dilate and form the Tunica Vazinalis. The Internal Lamina, which is here very thin, having accompanied the External Productions a little way, cleaves close to the Spermatick Vessels, and round Ligaments of the Womb.

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The Peritonaum has Veins and Arte-Its Vessels. ies from the Phrenica, from the Mamnillary, the Epigastrick, and often from the Spermaticks. Its Nerves are of those which are distributed in the Muscles of the Abdomen. It has likewise a few symphaticks, which discharge themelves into the Illiack Glands. By the Elasticity of its Fibres, it easily dilates and contracts in Respiration and Conception. If it breaks it causes a Rupure either in the Groin or Navel. Its Is is to contain the Bowels of the Abdomen, and to give each of them an outer Coat.

### SECT. IV.

## Of the Omentum.

When the Peritonaum is cut, as is ufual, and the Cavity of the Abdonen laid open, the Omentum or Cawl
presents it self first to View. This Its DeMembrane, which is like a wide and scriptionempty Bag, covers the greatest part of
the Guts. Its Mouth is tied in the right
ide to the Hollow of the Liver, in the
left to the Spleen, backwards to the
back part of the Duodenum, and that
part of the Colon which lies under the
Stomach, and forwards to the Bottom

of

The

of the Stomach and Pylorus. Its Bottom is loose, and being tied to no Part, but floating upon the Surface of the Guts below the Navel, was the reason why the Cawl was by the Greeks called 'Eximalor. Sometimes it descends as low as the Os Pubis, within the Productions of the Periton cum, causing an Epiplocele.

Now the Cawl is a most delicate and fine Double Membrane, interlarded, for the most part, with a great deal of Fat, which lines each fide of its Blood-Veffels. These are Veins from the Porta, called, Gastro epiplois dextra & finistra, Arteries from the Caliaca. The Intercostal Nerve, and the Par Vagum, fend it feveral Twigs of Nerves. All these Vessels, with some small Glands accompanying one another, spread their Branches very curioufly upon the Cawl, and even to the minutest Twig; they run between two Lines of Fat, which are bigger or smaller, according to the Weight of the Cawl. It has been sometimes found to weigh Five Pounds, but ordinarily it does not much exceed Half a Pound. Where there are no Veffels, the Membrane of the Cawl is very fine and transparent.

They give several Uses to the Cawl, as to cover the Bottom of the Stomach and the Intestines; that by cherishing

their

Its Use.

ottom their Heat, it may promote Digestion, , but and help the Concoction of the Chyle; Guts to strengthen and fullain the Vessels why which go from the Spleen to the Sto-ETT mach, Intestines, Pancreas and Liver, low as to keep a Store of the Fat, that it may ons of be received by the Veins and Lymphaticks, for the Use we have spoken of; e. elicate to greafe the Superficies of the Guts, terlarfor facilitating their Peristaltick Mogreat tion.

#### SECT. V.

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# Of the Oesophagus.

Though the Oesophagus and Dustus Thoracieus lie not in the Lower Bely; yet, that I may at once shew the ntire Passage of the Aliments from the Mouth to the Blood, I shall describe

hem both in this Chapter.

The Oelophagus, or Gullet, is a long, Its Situatinge, and round Canal, which descends tion, from the Mouth, lying all along betwixt the Wind-pipe and the Joints of the Neck and Back, to the fifth Joint of the Back, where it turns a little to the right, and gives way to the Aorta Descendens, and both run by one another, till at the ninth the Oesophagus turns again to the lest, climbs above

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the Aorta, and descending above it, it pierces the Midriff, and is continued to the left Orifice of the Stomach.

Its Cont.

The Gullet is compos'd of three Coats. The First and outermost is only a common Membranous Integument, which seems to be a Continuation of the Pleura.

The Second is thick and fleshy, and consists of two Orders of Muscular Fibres, Longitudinal and Circular, the first covering the last, these thrust the Aliments down into the Stomach. In Brutes, because the Situation of their Neck conduces little to the Descent of the Aliments, therefore these Fibres run in two close Spiral Lines which cross one another. But in Men, whose Position is Erect, the very Gravity of the Aliments helps their Descent.

The Third and last lines the Cavity

of the Gullet. It's composed of white and slender Fibres diversly interwoven. At its upper end it is continued to the Membrane that covers the Mouth and Lips, therefore, in Vomiting, these Parts are affected. Its lower end covers the left Orifice of the Stomach two or three Fingers breadth. The Surface of this Membrane is besineared with a soft and slimy Substance, which probably comes from some small Glands that lie be-

tween

ween this Coat and the Second.

The upper end of the Gullet is call'd The Musbarynx. It has two pair of Muscles cles of the r its Motion. The First is the Stylo-Pharynx.

haryngaus. This is a small and round uicle, which arises stessy from the toot of the Processis Stylordes, and deending obliquely, it is inserted into the less of the Pharynx. When this Muscle acteth it pulleth up and dilateth the

harynx, in Deglutition.

The Second is the Oefophagus. Its bres have several Directions; its supenor Fibres arise from the Processis Prereordeus of the Os Sphenordes, and from e Cornua of the Os Hyordes, and run oliquely to the back part of the Phanx. The Fibres which are below ese, arise from the sides of the Cartilogo Scutiformis, and run transversly to the middle of the back part of the Phamx, where both superior and infeor Fibres from both fides unite and orm a Tendinous Line. When this Auscle acts, it draws the back part of he Pharynx to its fore part; by which not only fraitens it for the depreffing f the Aliment, but it compresses also he Tonfille, which fend out their Liquor which lubricates the Aliment, whereby t glides the more easily down into the Stomach.

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cular Glands, which are tied on the back-fide of the Gullet about the fifth Vertebra of the Back, by the Branche of Nerves which come from the eight ItsGlands. Pair. These two Glands are like two Kidney-beans tied together; they receive Veins and Arteries from the Commaria, and they have Lymphatick Vessels which discharge themselves into the Thoracick Duct. Bartholine remarks that these Glands sometimes swell so big, as to hinder the Descent of the Aliments into the Stomach.

The Gullet at its upper end receives an Artery from the Aorta, and it sends a Vein to the Azygos: At its lower end it has an Artery from the Caliaca, and it gives a Vein to the Coronaria of the Stomach. Its Nerves are from the

eighth Pair.

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Its Use.

The Use of the Gullet, is to carry the Meat from the Mouth into the Stomach, by means of the Muscles of the Pharynx, and fleshy Fibres of the Gula, which perform its Peristaltick Motion.

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### pendicularly union the willows of the S E C T. VI: TEO INST and display any manifes of a charmen

Of the Stomach.

THE Stomach, Ventriculus, or Idene, Its Situalies immediately under the Midriff; tion. he Liver covers a part of its right fide, he Spleen touches it on the left fide, nd the Colon at its Bottom, to which fo the Cawl is tied. Its Figure re-Its Figure mbles a Bag-pipe, being long, large, ide, and pretty round at the Bottom, ut shorter and less Convex on its uper part, where it has two Orifices, one each end, which are fomewhat higher an the middle between them. The eft Orifice is called napolia, to it the sophagus is join'd. By this Orifice Its Orifice he Aliments enter the Stomach, where eing digested, they ascend obliquely the Pylorus, or right Orifice, which united to the first of the Intestines. t this Orifice the Tunicles of the Stonach are much thicker than they are ny where elfe, and the inmost has a hick and strong Duplicature in form of Ring, which ferves as a Valve to the ylorus when it contracts and shuts.

The Stomach is made of four Mem-Its Coats. pranes or Coats. The first and inmost s made of short Fibres which stand per-

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pendicularly upon the Fibres of the next Coat; they are to be feen plainly towards the Pylorus. When the Stomach is distended with Meat, these Fibres become thick and short. Whilst they endeavour to reffore themselves by their natural Elanicity, they contract the Cavity of the Stomach, for the Attrition and Expulsion of the Aliments. This Coat is much larger than the rest, being it is full of Plaits and Wrinkles, and chiefly about the Pylorus: These Plaits retard the Chyle, that it run not out of the Stomach before it be sufficiently digested. In this Coat there are also a great Number of small Glands which separate a Liquor which besmears all the Cavity of the Stomach, and helps the Concoction of the Aliments; therefore this Coat is call'd Tunica Glandulosa.

The Second is much finer and thinner; it is altogether Nervous; it is of an exquisite Sense, and it's called Ner-

vosa.

The Third is Muscular, being made of Straight and Circular Fibres; the Straight run upon the upper part of the Stomach, between its superior and inferior Orifices; and the Circular run obliquely from the upper part of the Stomach to the Bottom. Of these the

inner-

nnermost descend towards the right ide, and the outermost towards the est, so that by their Action both ends of the Stomach are drawn towards its middle, and the whole is equally conracted; by their Contraction and continual Motion, the Attrition and Digestion of the Aliments, is in a great Measure performed.

The Fourth Tunicle is common, it

comes from the Peritonaum.

The Stomach sends Veins to the Por-Its Vessels.

t.e., viz. the Gastrica, Pylorica, and Vas
Breve, and Branches to the Gastroepiplois dextra & sinistra, which are accompanied with Branches of the Arteria
Caliaca, all which lie immediately under
the fourth Coat of the Stomach.

The eighth Pair of Nerves, or Par Vagum, gives two considerable Branches to the Stomach, which descending by the sides of the Gullet, divide each into two Branches, the External and Internal. The two External Branches unite in one, and the Internal do so likewise; both which piercing the Midriff, form, by a great Number of small Twigs, upon the upper Orifice of the Stomach, a Plexus; and then the Internal Branch spreads it self down to the Bottom of the Stomach; and the External Branch spreads it self upon the inside, about

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the upper Orifice of the Stomach. This great number of Nerves, which is about the upper Orifice, renders it very fenfible, and from them also proceeds the great Sympathy betwixt the Stomach, Head and Heart; upon which account Van Helmont thought, that the Soul had its Seat in the upper Orifice of the

Stomach.
The Plexus Nervosi of the Hypochondria and Mesenterium give several Branches to the Bottom of the Stomach, therefore in Hysterick and Hypochon driack Paffions the Stomach is also af fected and apply and and the market in

Its Ufe.

The Use of the Stomach is Digestion, which is the Diffolution or Separation of the Aliments into such minute Parts as are fit to enter our Lacteal Vessels and circulate with the Mass of Blood: or it is the simple breaking of the Cohafion of all the little Molecula which compose the Substances we feed upon Now the principal Agents employed in this Action are, first, the Saliva, the Success of the Glands in the Stomach and the Liquors we drink, whose chief Property is to foften the Aliments, as they are Fluids, which eafily enter the Pores of most Bodies, and swelling them, break their most intimate Cohæsions. And how prodigious a Force Fluids is about ery feneds the comach, account e Soul

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gestion, paration te Parts Veffels, Blood: Cohawhich d upon oved in va. the tomach fe chief ents, as ter the welling ate Coa Force Fluids

fluids acting in fuch a manner have, e may learn from the Force that Waer, with which a Rope is wetted, has raife a Weight fastened to, and ustained at one End of it: and this orce is much augmented by the Impes which the Heat of the Stomach gives the Particles of the Fluids; nor does is Heat promote Digestion only thus, at likewise by rarifying the Air conined in the Pores of our Food, which ursts its Parts afunder. And therefore ch Liquors as are most fluid, or whose articles have the least Viscidity, are oft proper for Digestions, because ey can the most easily infinuate themlves into the Pores of our Aliments, d of all others Water feems the fittest r this Use, for tho' some spirituous iquors may as easily penetrate the Subances we feed upon, yet they have ather Property, by which they hurt ther than help Digestion, and that is, eir Particles have a ftrong atactive Force, by which when inbid into the Substance of our Victus, they draw their Parts nearer to one other, contract and harden, instead fwelling and diffolving them. It is ythis Property that they preserve Anial and Vegetable Substances from rrupting, not but that we find they fomefometimes help Digettion, yet not by dissolving the Aliments, but as they in ritate and excite the Coats of the Sto mach to a stronger Contraction, and therefore when they are duly diluted they may be not only useful but requisite But certainly frong Liquors alone an most unfit for Digestion, especially suc as are likewise viscid, and what fad E fects they have upon the Stomachi felf, they are truly sensible, who by a long use of them have lost the Appetite, hardly to be restored withou the drinking of Waters, which feldon fail of procuring a good Appetite an strong Digestion. When the Alimen are thus prepared, their Parts are for separated from one another, and di folved into a Fluid with the Liquors the Stomach, by the continual Motio of its Sides, whose absolute Power by that great Improver of the true Th ory of Phyfick, the learned Pitcairne, d monstrated to be equal to the Pressu of 117088 Pound weight : To which we add the absolute Force of the Di phragma and Muscles of the Abdoms which likewise conduce to Digestion the Sum will amount to 250734 Pour weight. Thefe two Actions we more clearly in Birds, because they a performed in two Stomachs. In the fir

Of the Intestines and Mesentery. It, the Corn is only swell'd and sofn'd by the Liquor of its Glands, but oken and diffolved in the second, hich is composed of very strong Muses, because those of the Abdomen and appragma are weak, neither do they upon the Stomach, as in Men.

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#### SECT. VII.

Of the Intestines and Mesentery.

THen the Aliments are sufficiently What the dissolved in the Stomach, they Guts are, by its Muscular Fibres, thrust out o the Intestines, or Guts. Now the estines are a long and large Pipe, ich, by feveral Circumvolutions and rnings, reaches from the Pylorus to Anus. They are knit all along to the ge of a Membrane called the Mesen-, and are fix times as long as the Boto which they appertain; that the yle which escapes the Lacteals of one rt of the Guts, may be taken up by ofe in the next. They are composed Their three Coats, of which the first and Coats. nost is made up of short Fibres bound gether by fine Blood Vessels, and sposed as those of the Stomach; for e Length of the Fibre is the Thick is of the Coat. Leeuwenhoeck first obferved

ferved these Fibres with his Glaffes: but if you carefully inject the Mesenterick Artery with warm Water, they will separate from one another, and become visible to the naked Eye. They act after the same manner as those of the inner Membrane of the Stomach. for the contracting of the Cavity of the Guts. This Coat being much longer than the others, lies in Wrinkles or Plaits, call'd Valvula Conniventes, which in the small Guts form larger Segments of Circles, and are closer to one another, than in the great Guts, where they are broader, and feem to be chiefly defigned to sustain the Weight of the Faces: whereas the others by retarding the Motion of the Chyle, and by directly opposing the Mouths of the Lacteal Veffels (which are in the upper fide of the Valves) to its Passage, give it a more favourable Opportunity, and better Chance for entring, than otherwife it would have. This Coat has likewise a great number of little Glands, which in the small Guts lie in Clusters every where but where they are knit to the Mesentery: In the great Guts they are much fewer, and are placed at some diffance from one another. The Use of these Glands is disputed: Some think that they feparate the Slime which be-(mears

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Cents.

mears the infide of the Intestines, to efend them against the Acrimony of he Bile; but this, more probably, omes from some Remainder of the Chyle. Others take them for the louths of the Lacteal Vessels: But here are many Lacteals where there are o Glands. If we confider, that they re mon chiefly placed where the Lacte-Is are most numerous, we cannot but hink that they feparate a Liquor for iluting of the thick Chyle, that it may ne more eafily enter the narrow Orices of the Lacteal Veins.

The fecond Coat is made up of two Orders of Muscular Fibres; of which ne runs straight, according to the ength of the Guts; the other goes bund, and its Fibres are more reasonbly thought to describe a Spiral Line han Circles. For if, as fome imagine, hese Fibres were not spiral, but circuar, it is not easy to conceive, how that onstant, and uniform Vermicular, or Wave-like Motion of the Intestines. ould be transmitted from part to part y Fibres, which had no Communication vith one another, but which having once surrounded the Gut, are at both Ends fixt to the Edge of the Mefentery: Wherea now by the successive Motion of the Parts of these two Orders of

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Fibres the Guts are in a continual IIn dulation, which is called their Peristal tick Motion.

The third and external Coat is com mon, it cometh from the Peritoneum

The Divi- Though the Intestines be one continu fion of the ed Pipe, yet Anatomists divide it int Guts. fix Parts, three thin and fmall, and three thick and great. The three this

Of the Duodenum.

and small are the Duodenum, Jejunum and Heum. The Duodenum is the fir part of the Intestines; its about twelve Fingers breadth long; it is continue to the Pylorus, from which, turning downwards, it runs under the Stomac immediately above the Vertebre, to wards the left fide, and ends at the first of the Windings under the Color At its lower end there are two Canal which open in its Cavity, one come from the Liver and Gall-Bladder, call' Dullus communis Cholidochus; the other from the Pancreas, call'd Dustus Pan The first brings the Bile creaticus. the fecond the Succus Pancreaticus into this Intestine. It differs from the other two in this, that its Passage is straiter and its Coats thicker.

The fecond is the Jejunum; it begin Of the Teat the first winding of the Guts under junum. the Colon, where the Duodenum ended; and making feveral Turnings and Wind-

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it begin its under ended; ad Windings ge from the Left side to the Right, it defrom the Right again to the Left, it continued to the Ileum, filling all the oper part of the Umbilical Region, ing about 12 or 13 Hands breadth ag. It differs from the Ileum only in is, that it hath some more Venæ Læe, into which the Chyle passing, it sound always more empty, therefore is call'd Jejunum: And the Folds of inner Coat are nearer to one another, d in greater Number than in the

The third and last of the small Guts Of the Ithe Ileum, it is about 21 Hands breadth leum,
ag; it begins where the Jejunum ends,
I making several Turnings and Windgs, it fills all the lower part of the
mbilical Region, and all the space beixt the Ilia, and is continued to the
ginning of the Colon at Right Anes; its Passage is a little narrower
an that of the Jejunum, and its Coats

em somewhat thinner.
This Intestine, because of its situation, is easily down into the Scrotum, by a Productions of the Peritoneum. In also happens the Volvulus, when one it of this Gut enters the Cavity of a Part immediately above or below.

The thick and great Guts are the Ca-

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Of the Intestines and Mesentery,

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cum.

Of the Cx-The Cecum, altho' small, yet is taken for the first of the great Guts ; but the Antients, who made this Division of the Guts, call'd the beginning of the Colon, the Cacum; and what is now call'd Cacum, they call'd Appendix Caci. It is four or five Fingers breadth long, and about the Bigness of a Swan's Quill. It is called Cacum, because it is open only at one end, by which it is tied to the beginning of the Colon, to which it feems to be an Appendage; fo that the Excrements go in and come out at the fame Orifice. Its other end, which is shut, is not tied to the Mesentery, but to the Right Kidney, by Means of the Peritonaum. Its Use is yet unknown. Some take it for a second Stomach, others for a Receptacle of the Excrements of the Fætus, in which it's always full, till after the Birth. Others fay it contains a Ferment, and others the Flatuofity of the Intestines; and others, that it separates a Liquor by some Glands which are in its Cavity, which Liquor ferves to harden the Excrements as they pass

The Colon is the greatest and widest of all the Intestines, and about eight of lon. nine Hands breadth long. It begins

through the Colon.

where the Ileum ends, in the Cavity of the Os Ileum on the Right fide, from

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thence ascending by the Kidney of the same side, it passes under the Concave side of the Liver, to which it is sometimes tied, as likewise to the Gall Bladder, which tinges it yellow in that place; then it runs under the bottom of the Stomach to the Spleen in the Left side, to which it's also knit; from thence it turns down to the Left Kidney, and then passing in form of an S, it ends at the upper part of the Os Sacrum into the Restum.

At the beginning of this Gut there is a Valve formed by the Production of the inmost Coat of the Intestines in this place; it hinders the Excrements which are once fallen into the Colon to return again to the Ileum. It has a strong Ligament, which running along its upper fide from the Ileum to the Rellum, ftrengthens it against the weight of the Excrements, and draws it together into Cells, which, with the Valvulæ Conniventes, retard the Passage of the Excrements, that we may not be obliged continually to go to Stool. The fleshy Fibres of its fecond Coat are greater and stronger than those of the other Intestines, because a greater Strength was requifite to cause the Excrements to ascend. The chief Design of the Colon's furrounding the Abdomen, and with the D 2 Rettum.

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Redum, touching all the Parts contain'd in it, seems to be, that by immediate Fomentation with Glysters, we might ease them of their Maladies.

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Of the Rectum.

The Redum is the last of the Intestines : It is a Hand's breadth and a half long: Its Cavity is about three Fingers in Diameter; Coats are thicker than those of the Colon. It begins at the upper part of the Os Sacrum, where the Colon ends, and going fraight down, it is tied to the Extremity of the Coceyx by the Peritonaum behind, and to the Neck of the Bladder in Men, and in Women to the Neck of the Womb before, from thence comes the Sympathy between these Parts. There is very much Fat about its external fide, therefore it is called the Fat Gut. Its Extremity forms the Anus, into which there are three Muscles inserted. The first is the Sphintler Ani, this is a fleshy Muscle about four fingers broad, compos'd of circular Fibres, which embrace the Extremity of the Redum for three fingers height, and which hang over it another fingers breadth; fo that in the Operation for a Figula in Ano, there is always an Inch more of this Muscle cut than there is of the Redum. It is connected forward to the Acceleratores Urine in Men, and to the Neck of the Womb in Women, and back-

Of the Muscles of the Redum. Of the Intestines and Mesentery.

backwards to the Os Coecygis. Its Use is to shut the Passage of the Anus, which

the weight of the Faces open.

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Now all these Guts lying in a little of the space, are kept from entangling one ano-Mesen-

ther by the Mesentery, which is a Fat tery. Membrane, placed in the middle of the Abdomen, almost of a circular Figure, with a narrow Production, to which the end of the Colon and beginning of the Redum are tied. It is about four Fingers breadth and an half in diameter ; its Circumference being full of Plaits and Foldings, is about three Ells in length. The Intestines, which are tied to this Circumference are about Eight or Nine Ells long; fo that to every Inch of the Circumference of the Melentery there are three Inches of the Intestines fastened. The Mesentery it self is strongly tied to the first three Vertebræ of the Loins. It's composed of three Lamine; the inner, upon which the Glands and Fat

D a

Of the Intestines and Mesentery.

lie, and the Veins and Arteries run, is its own proper Membrane; and the other two, which cover each fide of the proper Membrane, come from the Peritoneum.

Of the Vef- Between the two External Laminae of fels of the the Mesentery run the Branches of the Guts.

Arteria Mesenterica Superior and Inferior, which bring the Blood to the Intestines

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Arteria Mesenterica Superior and Inserior, which bring the Blood to the Intestines and the Venæ Meseraicæ, which being Branches of the Portæ, carry the Blood back from the Guts to the Liver. Here all the large Branches of both Arteries and Veins communicating with one another, march directly to the Guts, where, with the Nerves from the Plexus Mesentericus, they divide into an infinite number of smaller Branches, which spread themselves exceeding finely upon the Coats of the Intestines.

The Venæ Lasteæ and Lymphatick Vessels run likewise upon the Mesentery, in which there are also several Vesicular Glands, the biggest of which, in the middle of the Mesentery, is call'd Pancreas Asellii. These Glands receive the Lympha and Chyle from the Lasteal

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Of the Lasteal Veins, Receptacle of the Chyle, and Thoracick Dust.

Whilst the grosser Parts of the Aliments are by the Peristaltick Motion of the Guts, by the Pressure of the Midrist, and Muscles of the Lower Belly, thrust out at the Anus; the siner Parts, or Chyle, are by the same Powers squeez'd into the narrow Orifices of the Lasteal Veins.

These are long and slender Pipes, whose Coats are so thin as to become invisible when they are not distended with Chyle or Lympha. They arise from all the Parts of the Small Guts' by fine Capillary Tubes, which as they run from the fides of the Guts to the Glands in the Mefentery, unite and form larger Branches; these are call'd Vene Lattea Primi Generis. The Mouths of these Lacteals, which are open into the Cavity of the Guts, from whence they receive their Chyle, are so small, as not to be feen by the best Microscope. It was necessary they should be smaller than the finest Arteries in the Body, that nothing might enter which might stop the Circulation of the Blood. enthora

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The same Extremity of the Lacteals has likewise communication with the Capillary Arteries of the Guts, by which they receive a Lympha which dilutes and propels the Chyle forwards, and washes the Lacteals and Glands, that they may not furr, and be obstructed by the Chyle's staying in them upon fasting. The other Extremity of the Lacteals discharges the Chyle into the Vesicular Cells of the Glands dispersed up and down the Mefentery: And from these arise other Lacteals of a larger fize, which carry the Chyle immediately into the Receptaculum Chyli; they are call'd Lattea Secundi Generis. The Lacteal Veins have Valves at feveral distances, which hinder the Chyle from returning back into the Inteftines.

Assellius, who first discover'd the Lacteal Vessels, in the Year 1622, and his Followers, thought that they carry'd

Of the Re-the Chyle to the Liver; till Pequet, in ceptacu- the Year 1651, found out the Receptum Chy-taculum Chyli, and Dullus Thoracicus; tho' they both were elegantly describ'd by the Learned and Accurate Anatomist

Itaque in Bartholomaus Eustachius, many Years illis animantibus (scil. E. Veins.

quis) ab hoc ipso insigni trunco sinistro Juguli, qua posterior sedes radicis Vena interna Jugularis spectat, magnu quadam has

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quadam propago germinat, qua praterquam quod in ejus origine Ostiolum semicirculare babet, est etiam alba & aquei bumoris plena; nec longe ab ortu in duas partes scinditur, paulo post rursus coeuntes in unam, qua nullos ramos disfundens, juxta sinistrum Vertebrarum latus, penetrato septo transverso, deorsum ad medium usque lumborum sertur; quo loco latior essetta, magnamque Arteriam circumplexa, obscurissimum sinem, mibique non bone perceptum obtinet. Barth, Eust. Antigrammate xiii. de Vena sine Pari.

The Receptacle of the Chyle is eafily found in live Bodies, but with a greater Difficulty in those that are dead. It lies between the descending Trunk of the Great Artery, and the Vertebra of the Loins, and is biggest between the Celiack and Emulgent Arteries, furrounded by several Veficular Glands, call'd Glandule Lumbares, which difcharge their Lympha into it. The Receptacle receives all the second Order of Lacteals, as well as all the Lymphatick Veins both of the Legs, and of all the Parts contain'd in the Abdomen, so that indeed it feems to be only a Bag (which will contain about an Ounce of Water) form'd by the Union of these Vessels: The Bottom of it contracts to the smallness of a Lymphatick Vessel, the middle is sometimes divided into two or three Parts, and the upper Part stretches its self out D 5

into a Duct about the Bigness of a Goose Ouill. This Duct ascends into the Thorax behind the Great Artery; and about the Heart it frequently divides into two or three Branches, which immediately unite again into one, and creeping along the Guller, it marches to the left Subclavian Vein, where it opens at one or two Orifices, which are cover'd with a femi-lunar Valve, that the Blood may pass over them, and the Chyle run from underneath it, and mix with the Blood in the Veins. The Dustus Thoracicus has Valves at several Distances, which hinder the Chyle that has once pass'd them, from falling back. It receives the Lympheducts from the several Parts in the Cheft, as it passes along to the Subclavian Vein. By its running up the left fide, the Chyle receives a new Impetus from the Pulsation of the Great Artery; whereas on the right fide it must have ascended only by the Presfure of the Diaphragma, and Muscles of the Lower Belly upon the Receptacle, which it equally enjoys in its present Situation.

# SECT. IX

Of the Lymphatick Vessels.

Having frequent Occasion to mention the Lymphatick Vessels which have no particular Source or Originarion, but which almost all send their Lympha to the Receptacle of the Chyle and Thoracick Duct, just now describ'd; I shall therefore give a general Description

of them in this Place.

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The Lympheducts are flender pellucid Tubes, whose Cavities are contracted at fmall and unequal Distances, by two opposite femi-lunar Valves, which permit a thin and transparent Liquor to pass through them towards the Heart, but which shut, like Flood-gates, upon its returning. They arise in all Parts of the Body: But after what manner, I think, needs no great Dispute; for without doubt, all the Liquors in the Body (excepting the Chyle) are separated from the Blood in the fine Capillary Vessels by a different Pipe from the common Channel in which the rest of the Blood moves: But whether this Pipe be long or short, whether it be visible or invisible, it is still a Gland, whilst it suffers some parts of the Blood to pass through

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through it, denying a Paffage to others. Now the Glands which Teparate the Lympha, are of the smallest kind, being invisible to the finest Microscope; but their Excretory Ducts, the Lymphatick Vessels, unite with one another, and grow larger as they approach the Heart; yet they do not open into one common Channel, as the Veins do, for fometimes we find two or three, or more Lympheducts running by one another, which only communicate by fhort intermediate Ducts, or which unite and immediately divide again. In their Progress they always touch at one or two Conglobate or Veficular Glands, into which they discharge themselves of their Lympha. Sometimes the whole Lympheduct opens at feveral Places into the Gland, and fometimes it sends in only two or three Branches, whilst the main Trunk passes over and joins the Lympheducts which arise from the opposite side of the Glands, exporting again the Lympha to their common Receptacles. Now the Glands of the Abdomen which receive the Lympheducts from all the Parts which it contains, as likewife from the Lower Extremities, are the Glandu-læ Inguinales, Sacræ, Iliacæ, Lumbares, Mesentericæ and Hepatice; all which fend out new Lympheducts, which pour

pour their Lympha into the Receptaculum Chyli, as those of the Cheft, Head, and Arms, do into the Duttus Thoracicus, Jugular and Subclavian Veins. These Glands are round and smooth Bodies, about the bigness of a Hazle Nut, bigger or leffer, according to the number of Lympheducts they receive. Their Substance confists of Membranes, which divided the whole Bulk into little Cells, which receive the Lympha from the Lympheducts, and therefore they are improperly call'd Glands, being they separate no Liquor from the Blood. It's true, their Exporting Lympheducts communicating with their Arteries, do receive a Lympha from them : but this is done without the help of the Conglobate Glands, as the Lacteal Veins do with the Capillary Arteries of the Guts; and the chief Use of these Veficular Bodies feems to be, that the flow moving Lympha may receive a greater Velocity from the Elastick Contraction of their Membranous Cells, as well as from the new Lympha immediately deriv'd from the Arteries.

If you examine the Lympha Chymically, you will find that it contains a great deal of Volatile, but no Fix'd Salt, some Phlegm, some Sulphur, and

a little Earth.

The Use of the Lympha may be gather'd from the Confideration of the Parts into which it discharges it self. That which comes from the Head, Neck, and Arms, is thrown into the Jugular and Subclavian Veins. All the Lympheducts which the Parts in the Cavity of the Thorax fend out, empty themselves into the Thoracick Duct, and the Lymbha from all the rest of the Body flows to the Receptacle of the Chyle; fo that there can be no doubt, but that its chief Use, is to dilute and perfect the Chyle before it mixes with the Blood. Now the whole Lympha which is feparated from the Blood, being requifite for this Use, it is plain, that there could be no Glands in the Abdomen appropriated for the Separation of the whole Lympha, but what must have had a very great share of the Blood which passes through the Aorta, in order to feparate so great a Quantity of Lymbha. But the Liver and Kidneys requiring likewise a great Quantity of Blood, and which could not be avoided, Nature chose to separate the Lympha from the Blood which goes to all the Parts of the Body, rather than appoint particular Glands for it in the Abdomen, which would have been more at hand, but which would have robb'd the other Parts

Of the Glands in general.

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Parts of a large Quantity of Blood, and occasion'd a very unequal Distribution of it.

# SECT. X.

Of the Glands in general.

THE Modern Anatomists have reduced all the Glands of the Body to two forts, viz. the Glandulæ Conglobatæ,

and the Glandula Conglomerata.

A Conglobate Gland is a little, smooth The Con-Body, wrapped up in a fine Skin, by globate which it is separated from all other Gland. Parts, only admitting an Artery and Nerve to pass in, and giving way to a Vein and Excretory Canal to come out. Of this sort are the Glands of the Brain, the Labial Glands, and the Testes.

A Conglomerate Gland is compos'd The Conof many little Conglobate Glands, all glomerate
tied together, and wrapped up in one Gland.
common Tunicle or Membrane. Sometimes all their Excretory Ducts unite
and make one common Pipe, through
which the Liquor of all of them runs,
as the Pancreas and the Parotides do.
Sometimes the Ducts uniting, form feveral Pipes, which only communicate
with one another by cross Canals, and

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fuch are the Mamme. Others again have several Pipes, without any communication with one another, of which fort are the Glandulæ Lachrymalis, and Prostatæ. And a fourth fort is, when each little Gland has its own Excretory Duct, through which it transmits its Liquor to a common Bason, as the Kidneys.

Thus much of the Fabrick of the Glands, we know from Diffections: Their Inward Structure, and the Manner by which they fepatate the feveral Humours from the Blood, good Glaffes and found Reasoning must discover. The Antients thought that the Glands were Cisterns which contain'd certain Liquors, by which the Blood being fermented, throw off the Humours we find in the Excretory Ducts. But as these Ferments must mix with the Blood, so they must be exhausted and carried off by the Blood into Veins. And because all the Liquors in the Body are separated from the Blood, there must therefore be another Ferment to separate more: But this second Ferment is liable to the same Fate as the first; and therefore there must be an infinite Series of Ferments in the Body, which is absurd. If it should be said, that the Ferments are not carry'd off with the Blood, they must be stopp'd

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by the Structure of the Glandsk But then we have a Secretion without a Ferment, which is the Opinion of most of the Moderns. Some of which think that the Glands are Tubes, whose Orifices differing in Figure, admit only Bodies of fimilar Figures to pass through them. But this Opinion is demonstrably false: for beside that Liquors are susceptible of all Figures, and that Bodies of any Figure, and a lesser Diameter than that of the Gland will pass through, and that even a Body of a fimilar Figure, and equal Diameter with that of the Orifice of the Gland, may be presented innumerable Ways, and not be able to pass through, whilst there is only one way it can pass; I say, besides all these, it is easy to demonstrate, that all the Vessels in the Body are either Conical or Cylindrical, and consequently no difference in the Figure of their Orifices : For the pressure of a Fluid being always perpendicular upon the fides of the Veffel that contains it, and equal at equal heights of the Fluid, if the fides are fost and yielding, they must be equally distended; that is to fay, a Section perpendicular to the Axis of the Vessel must be a Circle, and consequently the Vessel be either Cylindrical or Conical. This Bellini.

Nick and is agreeable to the Observations and Speculations of the nigest Anatomists. who tell us, that a Gland is nothing but a Convolution of small Arteries, whose last Branches are Cylindrical, or, which is the same thing, part of an infinitely long Cone. A Gland therefore being nothing but a Branch of an Artery, whose furthest Extremity becomes the Excretory Duct of the Gland, let us confider how such a Structure can separate from the Blood only some Parts of it; and how different Glands may separate different Parts of the Blood. First then. if fuch a Fluid is to be drawn off, as confifts of the smallest Particles of the Blood, let that Orifice of the Gland. which is inferted into the Artery of which it is a Branch, be so small as to admit only the smallest Particles of the Blood; then thefe, and thefe only will enter this Gland, and the Fluid which passes out at the other Extremity of the Tube, or the Excretory Duct, must be such as is requir'd. If the Particles of the Blood, which are of the next Size or Magnitude, are requir'd to be separated, let the Orifice of the Gland be so big as to receive these second Particles, but small enough to exclude all bigger Particles; then thefe. fecond Particles, together with the first

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first or smallest, will enter the Gland: but because the Liquor to be secerned is to confift only of the fecond fort of Particles, that is, the fecond fort of Particles only are to flow out at the Extremity of the Tube, which is the Excretory Duct, therefore we are to suppose, that this Gland, (which is only a Branch of an Artery, and differs in nothing from a common Artery, but in the Narrowness of its Channel) has Branches which are big enough to receive the smallest Particles only, and carry them off into the Veins : fo that as both forts of Particles move together along the Gland, the smallest Particles will pass off through its Branches, and a Fluid, confishing chiefly of the Second fort of Particles, will arrive at the excretory Duct. Thus the Number of Branches may be so great as to draw off most of the smallest Particles, before the fecond fort of Particles arrive at the Excretory Duct; so the Liquor to be secerned, may confist of both these forts of Particles, mix'd together, in any Proportion, according to the number of Branches. If a Fluid, confifting of a third fort of Particles, larger than either of the former, is to be fecerned, the Orifice of the Gland must be just big enough to admit such Particles, and none bigger; and the Branches of the Gland must be small enough to exclude the biggest Particles, and big enough to receive the lesser, and according as the number of Branches is, either greater or smaller, the Fluid which runs out at the Excretory Duct will consist either of the largest Particles, or of all together mix'd in any Proportion. Thus we see how a Liquor thicker than the Blood, may be strain'd off from the Blood, if the Orisice of the Gland be so big as to admit Particles of all sizes, and the Branches so numerous as to draw off the thinner part before the thicker arrives at the Excretory Duct.

After this manner the feveral Humours of the Body may be feparated by the Glands from the Blood, which must either be compos'd of so many Humours as are separated from it, or else it must contain a few Principles, which mix'd all together, form the Blood, and which variously combin'd form the different Humours which are drain'd from it, as a few Rays of Light of different Refrangibilies mix'd all together, produce a white Colour, but variously combin'd, exhibit all imagi-

nable Variety of Colours

icles.

It is not at all probable that the Blood in which we discern but two distinct Parts, should be compos'd of near thirty fimple Humours; for fo many do the Glands secern from it. Nor is it agreeable to that Simplicity which Nature constantly affects in all her Operations. The Principles of all Natural Bodies are faid by Philosophers, not to exceed the number Five, and how prodigious is the Variety that results from their different Mixtures, and Modifications? If we suppose likewise but five Principles, or different Particles in the Blood, their Combinations alone, without different Modifications and Proportions, will yield near as many different Humours as are separated from the Blood. Nor is this purely a Supposition, but it is matter of Fact, that Urine, Sweat, Tears, Spittle, and Milk, are compound Liquors, and that in each of them there are Parts common to all of them. And if the Composition of some of the other Humours of the Body is not so apparent, it does no more follow from thence that they are not compounded, than it does that the Blood is not, because we do not perceive in it the feveral Humours, which by the Glands are separated from it. Being therefore the feveral Humours are form'd

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form'd by the various Combinations of a few Particles which compose the Blood, and that each Humour is fecern'd by Glands, plac'd for the most part in some one Part of the Body, as the Gall, which is separated no where but in the Liver, and the Urine in the Kidneys, the Particles of the Blood must fall into fuch Combinations as are fit to form Gall at the Liver, Urine at the Kidneys, and fo of the others, otherwife the Glands could never separate from the Blood fuch Humours. And being all the Humours are compos'd of a few different Particles, the greater will be the Number of Particles combined to form Bile, and the greater Quantity of Bile will be secerned, the fewer there are of all other Combinations at the Liver. Such Combinations therefore as are fit to form the Humours proper to pass through the Glands, where these Combinations are form'd, being there only requifite, will be there most numerous, and all others being there lefs requifite, or useles, will be there less numerous. And therefore, where ever the Particles of the Blood are most disfolved, there will be plac'd fuch Glands as separate Humours which confist of the most simple Combinations, or of Particles which do the most easily combine,

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omine. bine, and at the greatest Distance from these, will be fituated the Glands which fecern Humours confishing of the most compound Combinations, or of Particles which do the most slowly unite. And between these will be all other Glands, nearer to either Extreme, as they separate Humours more for less combin'd, or compounded of Particles, which do more quickly or flowly combine together. By the thinness of the Liquor in the Pericardium, and of the Urine which passes through the Kidneys, the Particles of the Blood feem to be most dissolv'd at and about the Heart. Here we not only find the Effects of this Diffolution in the Secretions, but likewife the Caufe of it, the Force of the Air in Respiration breaking the Globules of the Blood which Force is demonstrable to exceed the Preffure of 100 Pound Weight upon the Surface of the Lungs. Nor is it evident only from the Cause and Effects, that the Blood is here most dissolv'd, but likewise from the Methods which Nature takes to prevent the Effects of this Dissolution, in some particular Places at a little Distance from the Heart : For the Bile and Seed being thick Humours, compos'd of Particles which combine but flowly toge-

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ther, and it being requifite that they should be fecern'd where the Liver and Testicles are placid; Nature has made use of particular Contrivances, to give the Particles which were to form these Humours, more time to combine, than they could have had otherwise, being fo near to the Heart ! For the Formation of the Bile, she has contriv'd the Vena Porte, and the Spleen; through the first, the Blood moves near 200 times flower, and through the laft altogether as much, than otherwife it had done. And that the Particles which form the Seed might have time to combine, the Orifices of the Spermatick Arteries are contracted, and they likewise arise from the Vena Cava, a little below the Emulgent, at a great distance from the Testicles, contrary to the common Course of Nature, by which means the Blood is 150 times longer in going to the Testicles than otherwise it had been. At the greatest diffances from the Heart, the viscous Liquor of the Joints is secerned; and fome Liquors, whose Parts require no Combination, as the Lympha, may be fecerned any where. All these different Combinations, which form fo many distinct Fluids, arise from an attractive Power in the Parts of Matter,

ter, which, tho' it be equally diffus'd through the whole Mass, yet according to the different Densities of Particles, and the Figure of their Parts, fome forts of Particles will be foon united, while others require a longer time to be join'd together; fome Particles will cohere more firmly than others, and Particles of one Kind will have a greater tendency to unite with those of another forts in a certain Portion of their Surface. 200 laft than in any other. This attractive Force is different from that by which Sir Mado fe it Newton explains the Motions of the Heaicles venly Bodiesis for the Force of Attratime Ction, by which the Planets preferve pertheir Motions, decreases only in a reciand procal duplicate Proportion of their Di-Cava, frances; whereas this other feems to great decrease in a reciprocal Triplicate, or in ry to a greaten Proportion of the Distances , by of the parts of Matter from each other. imes But the Caufe of this Attraction I have than more fully explain'd in another Difatest course on Animal Secretion. The nar-Cous row Limits of my Defign will not allow and me to illustrate this Opinion any furre no ther : Another may be feen in Dr. Cockv be burn's Occonomia Animalis, who is among diffethe first who proposed to explain Secremation, from the different Velocities of n atthe Blood Mat-

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SECT.

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of the Pancreas, and Succus Pancrea-

Of the? Pancreas.

THE Pancreas, or Sweet-bread, is a Gland of the Conglomerate fort, fituated betwixt the bottom of the Stomach and the Verrebra of the Loins; it lies a-cross the Abdomen, reaching from the Liver to the Spleen, and is strongly tied to the Peritonaum, from which it receives its common Membranes. It weighs commonly four or five Ounces. It is about fix Fingers breadth long, two broad, and one thick. Its Substance is a little fost and supple; every little Gland has a small excretory Vessel, which uniting all together, form one common Duck about the bigness of a Quill, clear and transparent, like to a Lymphatick Veffel. This Duct runs all along the middle of the Pancreas, and opens into the Cavity of the Duodenum, at its lower end, where there is a little Caruncle at its Orifice. Sometimes it joins the Dustus Communis Cholidochus, and then both open at one Orifice into the Duodenum. This Canal was first found by Virtsungus, and is call'd Dustus Pancreaticus Virtsungi. The

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Of the Ductus Pancreaticus. The Pancreas receives Arteries from Of the the Caliack. Its Veins carry their Blood Veffels of into the splenick Branch of the Vena Porthe Panta, and the Intercostal furnishes it with creas. Nerves. The Use of the Succus Pancreaticus is to dilute the Chyle with the Liquor that is separated in the Glands of the Guts, that it may the more easily enter the Mouths of the Lacteal Vessels.

#### SECT. XII.

Of the Liver and Gall-Bladder.

THE Liver lies in the right Hypo-Its Situate thondrium. Its Convex and upper-tion. fide reaches a little beyond the Cartilago Xiphoides, and touches the Diaphragma. Its Concave and under-fide covers the Pylorus, and part of the Stomach, as also a part of the Colon, all the Duodenum, a part of the Jejunum, and of the Omentum. When we stand, its Extremity goes near to the Navel.

The Liver is almost round, and pretty Its Figure. thick. Its upper-fide is Convex, smooth, and equal; the other side is Concave, but not so equal. In its middle and forepart it is divided into two, by a Fissure, where the Umbilical Vessels enter. The Gall-Bladder is fasten'd to

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its under fide, where there are three Eminencies that the Ancients call'd Porta, of which one passes for a Little Lobe. When it is full of Blood, it is of a dark red colour; when the Blood is wash'd out of it, 'tis pale and foft.

Its Conmexion.

It is fasten'd in the Body by two Ligaments. The first, which is large and itrong, comes from the Peritonaum that covers the Diaphragma, and penetrating the Substance of the Liver, it joins the Capsula of the Vena Porta. The fecond is the Umbilical Vein; it comes from the Navel, and enters by the great Fiffure of the Liver to join the Vena Porta; After the Birth, it degenerates into a Ligament, but is of little use for the fastening the Liver.

Its Membranes.

'Tis cover'd with a common Membrane from the Peritonaum, besides that every Lobe and Gland has its proper

Membrane.

Its Subfance.

The common Membrane of the Liver being raifed, its Substance appears to be compos'd of small Glands of a Conick Figure (not easily to be perceiv'd in the Human Liver) and bound together by a proper Membrane into several Heaps or Lobes, which, like Bunches of Grapes, hang to the Bran-ches of the Vessels, from which each fmall Gland receives a Twig, and the Lobes

Lobes are tied to one another by small Membranes, which fill up the Spaces between them.

The Vessels of the Liver are, the Vena Its Vessels They are ac-Cava, and the Vena Porta. companied with many small Branches of the Arteries, which come from the Cæliack and Mesenterica Superior. The Vena Porta brings the Bloodfull of Bile for Secretion, and the Cava carries back the Blood that remains.

The Vena Portæ and the Cava enter the Liver by its Concave fide, and are equally distributed through all its Substance: where-ever there is a Branch of the one, there is a Branch of the other; fo that each Lobe, and each Gland in the Lobe, whether on the Convex or Concave fide, receive the same Vessels. The Vena Porta performing the Office of an Artery, brings the Blood full of Bile, which being frain'd off by the Glands, the rest of the Blood is carried back by the Branches of the Vena Cava to the Heart.

It receives its Nerves from the Plexus Hepaticus of the Intercostal Nerve.

Besides these Vessels, the Liver has Lymphatick Veffels, most of which open into the Conglobated Glands, near the Vena Porta, on the Concave side of the Liver; from thence the Lympha is car-E 3

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78 Of the Liver and Gall-Bladder.

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We come now to the Excretory

ceptaculum Chyli.

The Excretory Of the der.

Vessels of the Liver, which are, the Vessels of Vesicula Fellis, and Porus Bilarius. The the Liver. Vesicula Fellis, or Gall-Bladder, is fix'd to the Concave fide of the Liver, into Gall Blad-which its back part makes a small dint. Its Figure is like that of a Pear; 'tis of a different bigness almost in every Subject; the biggest is about the bigness of a little Hen-Egg: When the Liver is in its natural Situation, the bottom or largest part of the Bladder is downwards, and the Neck or narrowest part upwards; and then it touches the Stomach as well as the Colon, where it frequently dies them yellow. This Bladder is composed of three Coats, the outermost is common to it with the Liver; the next, which is proper to it, is thick and folid, composed of transverse, oblique and straight Fibres. The third is thin and nervous. This last Coat is cover'd within by a kind of Crust or Mucous, which preserves it against the Acrimony of the Bile, fecern'd probably by some small Glands which Malpighius has remark'd, be-tween its Coats, where the Cystick Arteries end, which gave him ground to think that it was the fame in the Porus

Porus Bilarius. The Bile is brought into the Gall-Bladder by some small Vessels which arise from the neighbouring Glands, and uniting, form one or two Pipes which open at the Neck of the Bladder. These Ducks I could never discover in any Liver but an Oxe's, tho' I have reason to think that they are likewise in a Human.

From the Neck of the Gall Bladder there goes a Pipe, not in a straight Line with the Bladder, but, as it were, more depress'd in the Liver: It is call'd Duffus of the Cyfticus. Some small Bilary Ducts o-Ductus pen likewise into it, and its inner Mem-Cysticus, brane has feveral Ruge, which retard the Motion of the Bile. To this Pipe, which is about the bigness of a Goose-Quill, is join'd another call'd Dustus Ductus Hepaticus, or Porus Bilarius. These two Hepatitogether make the Ductus Communiscus. Cholidochus, which goes obliquely to the lower end of the Duodenum, or beginning of the Jejunum. Afterit has pierc'd the first Coat, it runs near two Fingers breadth between the Coats, before it opens in the Cavity of the Intestine which oblique Infertion ferves inflead of a Valve to hinder the Bile to return into the Dullus Communis, having once enter'd the Intestine.

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Porus

Of the Po- The Porus Bilarius is another Excretosus Bilari-ry Vessel of the Liver. It has as many Branches as the Vena Porte, which it ac-

companies through every Lobe and Gland in the Liver. Where-ever there is a Branch of the one, there is a Branch of the other; and these two are enclos'd in one common Capfule, as in a Sheath: The Use of this Capfule is to facilitate the Motion of the Blood and Bile, by the contraction of its Fibres. All thefe Branches unite, and make one Trunk of the bigness of a small Quill, which joins (as we have faid) the end of the Dullus Cyflicus, for the carrying the Bile from the Liver to the Intestines, by the Da-Hus Communis Chalidochus. 10 , 11 11

The Infertion of the Porus Bilarius into the Dubbes Custiens, is oblique, with its Mouth looking towards the Dudus Communis; by which means it is impossible that the Bile which comes from the Castis can enter the Parus, unless the Dustus Communis be Ropp'd. 1999 it

The Bile which is found in the Gall-Bladder, is thinner, and different from that which is in the Porus Bilarius. This Malpighius proves by an Experiment, which is, that having tied the Dullus the

of the

Spleen.

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Cysticus, he remark'd, that the Bile which came by the Porus Bilarius, was of a different Taste, Smell, Colour, and Confistency, from that in the Gall-Bladder.

The Use of the Bile is to sheath or The Use blunt the Acids of the Chyle; because of the they being entangled with its Sulphurs, Bile. thicken it so as that it cannot be sufficiently diluted by the Succus Pancreaticus to enter the Lacteal Vessels. This appears not only from the Analysis of the Bile, which yields more of a Lixivious than of a Volatile Alcaline Salt: But likewise from what Leeuwenhoeck has observ'd, that of the great Quantity of acid Salts he has feen amongst the Aliments in the Stomach, he never could find any in the Chyle after it had pass'd the Duodenum.

Because some Chyle is almost always passing through the Duodenum, therefore it was necessary that the Bile likewife should be continually pour'd into it from the Dullus Hepaticus. In a Dog, whose Ductus Communis Cholidochus was near as big as a Man's, I have gather'd it at the rate of two Drachms in one Hour. But because a greater Quantity of Aliments requires a greater Quantity of Bile; therefore, according as the Stomach is more or

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less distended with Food, it presses out of the Gall-Bladder a proportionable quantity of Gall to be mix'd with the Chyle in the Guts.

#### SECT. XIII.

# of the Spleen.

Of the Si-THE Spleen is fituated in the left tuation, Hypochondrium, under the Dia-Connexion, phragma, between the Ribs and the Sto-and Shape mach, above the left Kidney: It is tied of the to the Peritonaum, to the Midriff, and to the Omentum. It is of a blewish or leaden Colour, of an oblong Figure, thick at the Edges, not thin, as the Liver. It has two Membranes. The External comes from the Peritonaum.

Cf the Internal
Membrane.

The Internal Membrane is finer and thinner than the External: For if you blow into the Splenick Artery, the Air shall pass through the one, but not the other. Its Fibres are not irregularly woven, as those of other Membranes seem to be; but they come from innumerable Points, as Rays from so many Centers; and the Fibres of one Point are regularly woven with the Fibres of the Points surrounding it. It receives Veins, Nerves and Arteries from those that enter the Spleen.

The

The Substance of the Spleen is not of the only kept together by its two Mem-Substance branes, but also by innumerable Fibres of the which come from the Points of the In-Spleen-ternal Membrane, and are inserted in the Points of the opposite side of the same Membrane, the Expansion of the Extremity of these Fibres seem to compose the Internal Membrane.

The Spleen is compos'd of an Infinity of Membranes, which form little Cells and Caviries of different Figures and Bignels, which communicate with one another, and which are always full of

Blood

At the Extremities of the Blood Veffels in the Spleens of Sheep, we find feveral small white and fost Specks, which

Malpighius calls Glands.

The Spleen has Arteries from the Arteries. Coliack, whose Capillary Branches make frequent Inosculations upon the Membranes of the Cells. Its Veins, whose Extremities communicate with the Cavities of the Cells, as they come out of the Spleen, unite and make the Ramus Splenisus of the Vena Porta, which carries the Blood from the Spleen to the Liver. These, with its Nerves, which are considerable from the Plexus Splenicus, are equally distributed thro the whole Substance of the Spleen, being

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being all included in a common Capfula. There are likewise a few Lymphatick Veffels which arife from the Spleen, and discharge them into the Lumbary Glands.

The use of

The Spleen being always full of a the Spicen. dark-colour'd Blood, was by the Ancients thought to be the Receptacle of the Atra Bilis, a Humour no where to be found. And all that has been faid about its Use by the Moderns, has been fo little fatisfactory, that it has been generally acknowledg'd, that its Use was still unknown. If we confider that the Bile is composed of Particles, which flowly combine or unite together, and that by reason of the Vicinity of the Liver to the Heart, and of the swift Motion of the Blood through the Aorta, thefe Particles could not in fo small a time, and with fo great a Velocity have been united together, had not the Blood been brought through the Coats of the Stomach, Intestines, and Omentum, by the Branches of the Vena Porte, to the Liver. But because all these Parts were not sufficient to receive all the Blood which was necesfary to be fent to the Liver; therefore Nature fram'd the Spleen, into whose Cavities the Blood being pour'd from a fmall Artery, moves at least a flowly

as any that passes otherwise to the Liver, by which means the Particles which compose the Bile in the Blood which passes through the Ramus Splenicus, by a so long and slow Circulation; have more Chances for uniting them, which otherwise they could not have had, had they been carried by the Branches of the Celiac Artery directly to the Liver, and consequently without the Spleen, such a quantity of Bile as is now secenced, that is, as Nature requires, could not have been secerned by the Liver. And this I take to be the true Use of the Spleen.

### SECT. XIV.

Of the Kidneys, Glandulæ Renales, Ureters and Bladder.

THE Kidneys are two in Number, Of the one on each fide; they have the Number fame Figure as Kidney-beans: Their and Figure length is four or five Fingers breadth; of the their breadth is three, and their thick-Kidneys. ness two: The Right is under the Liver, and the Left under the Spleen. In a Factus, their external Substance is divided into several Lobes join'd together, which in Adults becomes more close; therefore their Superficies is equal and finooth:

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fmooth: They have two Membranes. the one common from the Peritonaum, the other proper; they are ordinarily cover'd with much Fat; their Colour is a dark Red.

Of their Veffels.

We observe in the Kidneys, Lymphatick Veffels, which discharge them-Telves into Pequet's Refervatory, Nerves. which come from the Intercostals, Veins which go to the Cava; their Arteries come from the Aorta.

These Veins and Arteries are call'd Emulgents; they pierce the Reins in their Concave fides, (which lie nearest the Cava and Aorta) included in one Capsule, and are divided into several Branches, which furround the Pelvis. These Branches are again divided into an Infinity of other less, which go to the external part of the Reins, where they inosculate, and form a fort of Net. from which their Extremities coming. terminate in an infinity of little Glands.

fance.

Their Sub. These Glands are of a round Figure; they compose the outer Substance of the Reins, which is half a Finger thick. From each of them there goes a long. fmall Tube, these Tubes compose the inner Substance of the Reins. As they approach the Pelon or Bason, they gather together in little bundles, whose Extremities piercing the Membrane of the

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the Pelvis, form those little Protuberances on the infide of the Pelvis, call'd
Papilla. The Pelvis or Bason is a Cavi-Ofthe Pelty in the middle of the Kidneys, form'd vis.
by a Dilatation of the Ureters. It sends
out several Ramisscations, which divide
the Urinary Tubes into Bundles, and
which make a fort of Capsula to the
Blood Vessels.

The Use of the Reins is to separate The Use of the Urine from the Blood, which, by the Kidthe motion of the Heart and Arteries neys. is thrust into the Emulgent Branches, which carry it to the little Glands; by which the Serosity being separated, is received by the Orifice of the little. Tubes, which go from the Glands to the Pelvin; from thence it runs by the Ureters into the Bladder. The Blood which could not enter the Glands, is brought back by the Emulgent Veins.

In the middle between the Aorta and Of the the Kidneys, a little above the Emul-Glandulæ gent Vessels, are situated the Glandulæ Renales. Renales or Capsulæ Attrabilares. They are two in number, one on each side, wrapt up insome Fat: They sometimes change their Situation, and their Figure is also various; for in some they are round, in others square, triangular, or of an irregular figure; the Right is ordinarily bigger than the Lest, and each about

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about the bigness of a Nux Vomica: In a Fætus they are always almost as big as the Kidneys. They are cover'd with a fine Membrane, and within they have feveral small Sinus's which contain a blackish fort of Liquor. Their Blood-Vessels are Branches, sometimes of the Vena Cava and Aorta, and sometimes of the Emulgents.

Their Veffels and Use.

The Intercostal Nerve furnishes a Branch, which makes a Plexus upon them. Their Use is not yet known. Some think they feparate a Liquor from the Arterial Blood, for the liquifying the Blood which is too thick after it comes from the Kidneys.

Of the Ureters.

The Ureters are two long and small Canals which come from the Basons of the Kidneys, one on each fide; they lie betwixt the doubling of the Peritonaum; and descending in the form of an S, they pierce the Bladder near its Neck, where they run first some space betwixt its Coats, and then they open inits Cavity.

Their Coats.

They are composed of three Coats: The first is from the Peritonaum: The fecond is made of fmall oblique muscular Fibres: And the third, which is very sensible, has several small Glands which separate a slimy Liquor, to defend it against the Acrimony of the Urine.

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rine. The neighbouring Parts furnish them with Blood-Vessels, and their Nerves come from the Intercostals, and from the Vertebra of the Loins. Their Cavity is sometimes contracted in three or four Places, especially towards the Bladder. Such as are subject to the Gravel, and given to excessive Drinking, have them sometimes so much dilated, that you may put the end of your Little Finger into them. Their Use is to carry the Urine from the Reins to the Bladder. Their Obstruction causes a Suppression of the Urine.

The Bladder is fituated between the Of the Duplicature of the Perisonaum, in the Bladder, lower part of the Abdomen, between

the Os Sacrum and the Os Pubis, above the straight Gut in Men, and the Neck of the Womb in Women. It's tied to the Navel by the Urachus degenerated into a Ligament, and its sides to the Umbilical Arteries; its Neck to the Intestinum Restum in Women. The Human Bladder is not of the Shape of a Pear, as is commonly said, being rather biggest near its Neck; the Urine pressing mostly there, by reason of our erect Station. It is composed of three Coats: The sirst is a Covering of the Peritonaum. The second is composed of muscular Fibres, which run irregu-

larly feveral ways. And the third which is full of Wrinkles for facilitating its Dilatation, is both Glandulous, and Nervous. Its Glands separate a viscous and flimy Matter, which defends it from the Acrimony of the Salts in the Urine. Around its Neck (which is longer in Men than in Women) there goes a small Muscle call'd Sphintler Vefice, which contracts the Orifice of the Bladder, that the Urine may not run out, but when it thrusts open the Pasfage, by the Contraction of the second Coat of the Bladder, which is therefore call'd Detrusor Urine. The Blood-Vessels of the Bladder are Branches of the Hypogastricks: Its Nerves come from the Intercostals. Its Use is, to be a Reservatory of the Urine, that it may not incessantly run from us, as it is separated in the Kidneys.

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We find in the Urine much Phlegm and Volatile Salt, a little Sulphur,

Earth, and fixt Salt.

### SECT. XV.

Of the Parts of Generation proper to Men.

THE Parts of Generation proper to Men may be fitly divided into those which prepare and separate the Seed proper to Men.

Seed from the Blood, and those which convey it into the Womb. The first is done by three forts of Glands, which are the Testes, the Vesicula Seminales, and the Proftate. The fecond is the

Office of the Penis or Yard.

The Testes, which prepare the principal part of the Seed, receive their Blood from two long and slender Arteries, which, at their Rife from the Sides of the Aorta, a little below the Emulgents, are extreamly fmall, but immediately become bigger; the reafon of which Mechanism we have already explained in speaking of Secretion. As these Arteries run between the Duplicature of the Peritonaum, to which they give some small Twigs, they pass out of the Abdomen at the Holes in the transverse and oblique Muscles, and march over the Os Pubis, within the Productions of the Peritoneum, to the Testicles; but before they arrive, they divide each into two Branches, the largest of which are spent upon the Testicles themselves, and the two small ones upon the Epididymides. When the Blood has discharged it self of the Seed into the Testicles, it returns by the Veins, which rifing in feveral Branches from the Testes, tend towards the Abdomen, in the Productions of the Peritonaum.

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toneum, the same way the Arteries came down. In their progress, their Branches frequently inosculate, and divide again, till they come near the Abdomen, then they all unite in one Trunk; and therefore because of their Shape, are called Corpora Pyramidalia. In the Abdomen they receive some small Twigs from the Peritonaum. The right Spermatick Vein opens into the Vena Cava, a little below the Emulgent: but the Left is always inferted into the Emulgent of the same fide, that it may not be obliged to cross the Aorta, whose Pulse would be apt to stop the Blood E which returns from the Testicles very howly, by reason of the narrow Orising ces of the Spermatick Arteries, and the largeness of the Veins. These Blood-Vessels have been called the Vala Praparantia. Having described the Blood Vessels of

The Vafa Præparantia.

> the Testicles; I come now to their Integuments, which are Three, one Common, and two Proper. The Common is the Scrotum, which besides the Skin, skin, which is very thin and full of Blood. (which is very thin and full of Blood-Vessels) Scarf-skin, and Membrana A diposa, in this place likewise very thin, its Vesicles being empty of Fat; is composed likewise of many fleshy or muscular Fibres, by means of which the Scro-

Of the Scrotum. S

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tum is contracted, which is reckoned a came Sign of Health. This muscular Lining Branof the Scrotum is by the Greeks called Dartos. The Scrotum is divided in the ivide Abdomiddle by a thin Membrane, which seunk; parates the two Testicles. hape, The first of the proper Integuments The Tuthe

is called Tunica Vaginalis, or Exudenessis, nica Vabeing formed by the Dilatation of the giualis. Productions of the external Membrane of the Peritonaum; its internal Superficies s smooth, its external rough: It contains the Vasa Praparantia and Deferentia; t embraces loofely the whole Body of the Testicle, adhering to one end of the Epididymis. Upon the outside of this l'unicle runs a Muscle call'd Cremaster, didymus. Orififrom its Office; it rises from the Os nd the Pubis, and spreading its Fibres upon the Blood-Elythroides, it suspends the Testicles, and la Præfraws them up in the Act of Generation. ffels of

The fecond is that which covers im-Of the Almediately the Testicles. It is call'd Al-buginea. buzinea, because of its white Colour. s strong and thick, very smooth and e-Blood- arantia are Spole with the Vafa Praarantia are finely wav'd upon it.

The Substance of the Testicles, which of the y thin, ormerly was thought to be a fort of Substance is com- Marrow, is nothing but the folding of of the Te muscu- everal small and soft Tubes, disposed insticles.

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fuch a manner, that if they could be feparated from one another, without breaking them, they might be drawn out to a great length. They run in short Waves from the Tunica Albuginea to the Axis of the Testicles, being divided from one another by thin membranous Productions from the inner fide of the Albuginea. These Productions unite at the Axis of the Testicle, and form a Coverto some small Tubes which at one end of the Testiele pierce the Tunica Albuginea, and unite into one Canal, which by feveral turnings and windings upon the upper part of the Testicles forms that Of the Epi-Body which we call Epididymu, cover'd

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didymis.

Of the Vasa Deferentia.

with a thin Production of the Albuginea. The fame Canal continuing and ascending from the Extremities of the Epididymides, forms the Vafa Deferentia, one from each Epididymis, about the bigness of a Goose-Quill: as they ascend within the Tunica Vaginalis, they make feveral short turnings and windings; then they enter by the Holes of the transverse and oblique Muscles into the Abdomen, and marching over the Ureters between the backfide of the Bladder and the Restum, they grow larger as they approach the Vesicula Seminales, (which open into them) where they come close to one another, and

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and growing again smaller and smaller, they pass through the Prostate, and open into the Urethra, a little below the Neck of the Bladder, where each Orifice has a spongious Border, call'd Caput Gallinaginis, which hinders the involuntary running of the Seed. The Cavity of the Vafa Deferentia, before they enter the Abdomen, will hardly admit of a Hog's Briftle; as they encrease, fo likewife do their Cavities, which are tortuous, and obliquely contracted by their inner Coat, which is nervous, whiter and thinner than the External. which is compos'd of Muscular Fibres. The Testicles have many Lympheducts, which discharge themselves into the Inguinal Glands. Their Nerves come from the Intercostal, and 21st of the Spine.

The Spermatic Arteries carry the Blood from the Aorta to the Testicles, which separate that part of it which is sit for Seed. The Veins carry back to the Cava what Blood remains, after the Secretion of the Seed. The Seed is surther purify'd in the Epididymides, and in Coition is carry'd by the Vasa Deservatia into the Urethra. As the narrow Orifices, and great length of the Spermatic Arteries (which give time to the slow moving Particles of the viscous Seed to combine and unite)

are a clear Proof of what we have faid concerning the Formation of the Humours to be fecern'd; fo the length of the Tubes which compose the Body of the Testicles, does not less evidently evince the Structure we have given of a Gland : For the Particles which compose the Seed, being gross, all the fmaller Particles of the Blood must enter the Tubes with them, and therefore, that none but the Particles of the Seed might arrive at the Kas Deferens, it was necessary that the Tube of the Gland should be long baving many imaller Branches, to convey off all the leffer Particles, which were not to enter into the Composition of the Seed Many of these Particles must be Lymphatick, because of the great Proportion they bear in the Blood; and therefore we find that the Testicles as well as the Liver, have a multitude of Lymphatick Veffels. The reason of the Length of the Vafa Deferentia, is, that the impetus of the Seed at the Caput Gallinaginis might not be sufficient to dilate the Orifices of the Vala Deferentia, but when affished with the Compression of the furrounding Parts in Copulation.

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Of the The Vesicula Seminales are two in Vesicula number, one on each side, situated be-

twixt the Bladder and the straight Gut, tied to the one and the other by a Membrane of fleshy Fibres, which, in time of Coition, contracts and preffes the Vesicula: They are cover'd with a pretty thin Membrane, upon which do creep many Branches of Veins, Arteries, Nerves, an Lymphaticks. Their External Surface resembles rather that of the Brains, than that of the Guts of a little Bird; they are about two Fingers breadth long, their broadest part is not an Inch, from which they grow narrower by little and little to their End, which is next the Proftrate. They have two confiderable Cavities divided into membranous Cells, which open distinctly by two Orifices which are in their small Extremities, into the two Vafa Deferentia, from which they receive the Seed which is separated in the Testicles, to be kept till Coition.

The Prostate, or Corpus Glandulosum, Of the is a Conglomerate Gland situated at the Prostate. Neck of the Bladder, cover'd with a Membrane made of muscular Fibres, as that of the Vesiculæ, and for the same Use. It is about the bigness of a Wallnut. The Vasa Deferentia pass through its Substance, which is Vesicular and Glandulous. The Glands (which like little Grains lie upon the Sides of the

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Veficles) separate a clear and mucilaginous Humour, which lies in the Veficles till Coition, that it is carried into the Beginning of the Urethra by eleven or twelve excretory Ducts, which open about the Orifices of the Vafa Deferentia; The Border of their Mouth is all fpongious, to hinder a continual running of this Humour, which happens in a Gonorrhea, when their Orifices are corroded by the Morbifick Matter, which is thrust, by the Elasticity of the Air, into the empty Ducts, upon Coition.

Of the Ward.

The other principal Member of the Parts of Generation, is the Penis or Yard, whose Shape and Dimensions are pretty well known. Its Skin, which is thin, and without Fat, has a Reduplication, which makes a Hood to the Glans or End of the Yard, call'd Praputium, or the Fore-kin. The fmall Ligament by which it is tied to the under fide of the Glans, is call'd Frænum. The Use of the Preputium is to keep the Glans foft and moift, that it may have an Exquifite Sense.

The Substance of the Yard is composed of two spongious Bodies, call'd Corpora Cavernofa; they arise distinctly from the lower part of the Os Pubis. A little from their Root they come close sogether, being only divided by a Mem-

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brane, which at its Beginning is pretty thick, but as it approaches the End of the Yard, it grows thinner and thinner, where the Corpora Cavernosa terminate in the middle of the Glans.

The external Substance of these spon-

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The external Substance of these spongy Bodies is hard, thick and white. The Internal is compos'd of small Fibres and Membranes which form a fort of loose Net-work, upon which the Branches of the Blood-Vessels are curiously spread. When the Blood is stopt in the great Veins of the Penis, it runs through several small Holes in the sides of their Capillary Branches into the Cavities of the Net-work, by which means the Corpora Cavernosa become distended, or the Penis erected.

Along the under fide of the Corpora Of the Cavernofa, there runs a Pipe called the Urethra. Urethra, which is about twelve or thirteen Inches long, beginning at the Neck of the Bladder (from which it receives the Urine) it bends to the lower part of the Os Pubis, and turning up to the Roots of the Corpora Cavernofa, is continued to the End of the Yard. The Sides of this Pipe are composed of two Membranes, and a middle spongy Substance, like that of the Corpora Cavernofa, except at the End which joins the Neck of the Bladder;

where the Distance between the Membranes is small, and filled up with a thin, and red glandulous Subfrance, whose Excretory Ducks piercing the inner Membrane, pour into the Pipe a mucilaginous Liquor. The external Membrane is hard, close and white, the Internal, which lines the Cavity of the Urethra, is thin, loft, and of an exquifite Senfe. The spongious Substance which lies between the two Membranes, is about ! a Line thick next to the Corpora Cavernofa, 1 1 Line round the rest of the Pipe. The Extremities of this fpongy Substance are much thicker than in the middle: That end next the Prostate, because of its Bigness, is call'd the Bulb of the Urethra, being about ' an Inch thick, and divided in the middle by a thin Partition, as the Corpora Cavernofa are. The other End forms the Glands or Ba-Janus upon the Extremities of the Corpora Cavernofa. The Veins in the Urethra have Holes in their fides, through which the Blood passes into the Cavities of its Net-work, in an Erection, as in the Corpora Cavernofa.

On each fide of the Bulb of the Urethra there lies a small Gland, whose excretory Duct sloping forwards, pours anto the Urethra a viscous and transpa-

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rent Liquor, which defends it against. the Acrimony of the Salts of the Urine. And on the opposite side of the Uretbra, upon its internal Membrane, a little nearer the Glands, there is another small Gland which has the fame Office. Thefe Glands were first observed by that diligent Anatomist, Mr. Cowper. At the other end of the Urethra, around the Crown of the Glands, where it joins the Praputium, is a Row of small Glands, like unto these of the Cilia, call'd by that accurate Anatomist, Dr. Tylon, Glandula Odorifera: They Separate a Liquor, which lubricates the Glands, that the Praputium may flip eafily upon it.

The Yard has a small Ligament, of the which arises from its back, a little di-Vessel of stance from its Root, which ties it to the Yards the upper part of the Os Pubis, that it may not hang too low. It receives two Branches of Veins and Arteries from the Hypogastrick Vessels; besides others from the Pudenda. The two Veins unite near its Roots, and form one Trunk, which runs along the upper side of the Yard. It has two Nerves from the Os Sacrum, and several

into the Inguinal Glands.

Lymphaticks, which empty themselves

Of the Parts of Generation

Of its Muscles and Ere-Hion.

The Yard has three pair of Museles. The first is the Erestores; they rife from the Ischium, a little below the Roots of the Corpora Cavernofa, they lie upon them, and are inferted into them. The Second are the Acceleratores; they rife from the Root of the Urethra; they have several Fibres, which join the Fibres of the Sphinfter Ani; they lie upon the Urethra, betwixt the two former, and are inferted into the Corpora Cavernofa. The Third Pair are the Transversales, they arise from the Ischium just by the Erectores, and run obliquely to the upper part of the Bulb of the Urethra. When these Muscles act, they press the Veins upon the back of the Penis against the Os Pubis, which is the Cause of the Erection, as has been said.

## SECT. XVI.

Of the Parts of Generation properto Women.

HAving in the First Chapter described the Figure and Situation of the External Parts of Generation proper to Women; I shall here only examine their Substance and Use, and then proceed to the Internal Parts.

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The Clitaris, which is in the fore-part Of the of the Vulva, is a long and round Body, Clitoris. naturally about the Bigness of the Uvula: It lies within the Skin; nor does any part of it appear outwardly, except its Extremity, which is cover'd with a Folding of the Skin, made by the Union of the Nympha, call'd its Prautium. The Substance of the Clitoris is compos'd of two spongious Bodies, such as those of the Yard; they rise disinctly from the lower part of the Os Pubis, and approaching one another, they unite and form the Body of the Clitoris, whole Extremity, which is of an exquisite Sense, is called its Glans. The two fpongious Bodies, before they unite, are call'd the Crura Clitoridis; they are twice as long as the Body of the Clitoeis. It has two Muscles, which rife from Its Musthe Protuberance of the Ischium, and cles. are inferted in its spongious Bodies. They erect the Clitoris in Coition, after the same manner that the Muscles of the Yard do erect the Yard.

The Clitoris receives Veins and Arte-Its Vessels. ries from the Hæmorrhoidal Vessels and the Pudenda, Nerves from the Intercostals, which are likewise distributed thorow all the Parts of the Vulva. Remark, that the Veins on the one side of the Vulva communicate with those of

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the other fide, and so do the Arteries communicate with one another.

Of the Nymphæ.

The Nymphæ have been sufficiently described already. Their internal Subflance is spongious, and full of Blood-Vessels, therefore they swell in the Act of Copulation; they receive Veffels and Nerves as the Clitoris: Their Use is to defend the internal Parts from external Injuries, to encrease Pleafure in Coition, to direct the Course of the Urine: They are bigger in marry'd Wemen than in Maids.

Hymen.

The Hymen is a circular Folding of the inner Membrane of the Vagina: which being broke at the first Copulation, its Fibres contract in three or four Places, and form what they call

Glandula Myrtiformes.

A little beyond the Clitoris, in the fore-part of the Vulva, above the Neck of the Womb, there is a little Hole, which is the Orifice of the Urethra: It is naturally fo large as to receive a Probe as big as a Goofe-Quill. The Length of the Neck of the Bladder is near about two Fingers breadth. It has a little Muscle call'd its Sphinster, which embraces the Urethra, to hinder the involuntary running of the Urine; it joins the fleshy Fibres which are at the Orifice of the Vagina.

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Between this Muscle and the inner Membrane of the Vagina there are several little Glands, whose Excretory Ducts are called Lacune: They pour a Lacune viscous Liquor, for the tickling of the Sex, into the lower part of the Vulva. These Glands are the Seat of Gonorrheas in Women, as the Prostate are in Men; and have the same Use that they have. They have been found all ulcerate in Women which have had a Gonorrhea.

The Vagina, or Neck of the Womb, Vagina. is a long and round Canal, which reaches from the Pudendum to the internal Mouth of the Womb. In Maids 'tis about five Fingers breadth long, and one and a half wide; but in Women who have born Children, its Length and Bigness cannot be determined, because it lengthens in the time a Woman is with Child, and it dilates inthe time of Birth. It lies betwixt the Bladder and the Redium, with which last it is wrapt up in the same common Membrane from the Perisonaum; for this Reason the Excrements come out sometimes by the Vulva, when this Intestine is wounded.

The Substance of the Vazina is composed of two Membranes, of which the inner which lines its Cavity, is nervous and full of Wrinkles and Sulei, efpecially in its Fore-part. It has three or four small Glands on that side next the Resum, which pour into it a viscous Humour in the time of Coition, of which we have spoken before.

The Wrinkles of this Membrane are for the Friction of the Balanus, to encrease the Pleasure in Copulation, to detain the Seed that it run not out again, and that it may extend in the Time of

Gestation.

The External Membrane of the Vagina is made of Muscular Fibres, which (as occasion requires) dilate and contract, become long and short, for adjusting its Cavity to the Length and Bigness of the Yard. At its lower Part there is a Muscle of circular Fibres like a Sphincter, and under it on each side of the Vagina, a Net-like Plexus of Blood-Vessels, which, with the Muscle helps to straiten the Mouth of the Vagina, that it may grasp the Yard closely.

The Neck of the Womb receives Veins and Arteries from the Hypoga-flrick and the Hæmorrhoidal Vessels. Those from the Hypogastrick are dispersed in its upperpart, and those from the Hæmorrhoidal in its lower part. These Vessels communicate with one

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another. It has Nerves from the Os Sacrum. Among other Uses, the Neck of the Matrix serves for a Conduit to the Menstrua, and for a Passage to the Fætus.

The Matrix or Womb is fituated in Of the Sithe lower part of the Hypogastrium, be-tuation of
twixt the Bladder and the Straight Gut; the Mathe Os Pubis is a Fence to it before; trix.
the Sacrum behind, and the Ilium on
each fide; they form as it were a Bason
for it; but because it must swell whilst
Women are with Child, therefore they
leave a greater Space in them than
Men; it is for this Reason, that Women are bigger in the Haunches than
Men.

The Figure of the Womb is like a Of its FiPear, from its internal Orifice to its gure.
Bottom; 'tis three Fingers long, twobroad, and almost as much thick. In
Maids its Cavity will contain a big Almond: It changes both Figure and
Dimensions in Women that are with
Child; it presses the Bowels, and
reaches to the Navel towards their Delivery, whilst at other Times it does
not pass the Os Sacrum.

The Womb is covered with the Peritonaum. Its Substance is composed of of its fleshy Fibres, which are woven toge-Substance. ther like a Net, and they draw toge-

ther

ther and make several Bundles, which have several Directions for the better contracting of the Womb in the Expulsion of the Fetus. The Spaces between these Fibres are fill'd up with thin and fost Membranes, which form an infinite Number of Cells, upon which the Blood-Vessels run; turning and winding frequently. Upon these Membranes, especially towards the Cavity of the Womb, there are several Glands which separate an Humour to lubricate the Cavity of the Womb.

The Bottom of the Womb grows thick, as it dilates, so that in the last Months of Gestation, 'tis at least an Inch thick, where the Placenta adheres, because its Roots run into the Substance

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of the Womb.

The Entry into the Cavity, or the Mouth of the Womb, joins the upper End of the Vagina, and makes a little Protuberance in the Form of Lips, which refembles the Muzzle of a little Dog, by some call'd Os Tinca. The Cavity of the Womb next its internal Orifice being more contracted than it is near to its Bottom, is called Collum minus Uteri. Its Surface is unequal, and among its Ruga, open several small Ducts, which discharge a glutinous Liquor to seal up the Mouth of

the Womb in Gestation. The Ducts are affected in a Fluor Albus.

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The Veins and Arteries of the Womb Of its Vefare Branches of the Hypogastrick and sels. Spermatick Vessels, whose larger Ramifications inofculate with one another; the Spermatick Artery with the Hypogastrick, and the Vein with the Vein, as also the Branches of one fide of the Womb with those of the other. When the Term of Accretion draws to a Period, and the Blood which was wont to be spent in the Encrease of the Body, being accumulated, distends the Vessels, it breaks forth once a Month, at those of the Womb, because of all the Veins in the Body, which stand perpendicular to the Horizon, these only are without Valves. This Evacuation is called the Menstrua, to which Men for the same Reason are subject, but in them the redundant Humour paffes off by Urine, as Sanctorius observes, and rarely by the Hæmorrhoidal Veins.

Its Nerves come from the Intercofials, and from those which come from the Os Sacrum. There are also several Lymphaticks upon its Out-side, which unite by little and little into great Branches, and discharge themselves in the Reservatory of the Chyle. All the Vessels of the Womb creep upon it by many Turnings and Windings, that they may not break when it is distended.

Of its Li-

The Womb is tied by two forts of Ligaments; by two broad, call'd Ligamenta Lata; and by two round; call'd Ligamenta Rotunda. The two broad Ligaments are only a Production or Continuation of the Peritoneum from the fides of the Womb: For their Largeness and Figure, they are commonly compar'd to the Wings of a Bat. The Ovaria are fasten'd to one End of them, and the Tubæ Fallopianæ rung along the other.

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The two round Ligaments rife from the fore and lateral part of the Bottom of the Womb, and pass, in the Produations of the Peritonaum, through the Rings of the oblique and transverse Muscles of the Abdomen to the Os Pubis, where they expand like a Goofe Foot, and are partly inserted in the Os Pubis, and partly continu'd or join'd to the Musculus Membranosus, or Fascia Lata, on the upper Part of the infide of the Thigh; from thence comes the Pain that Women big with Child feel in this Place. The Substance of these Ligaments is hard, but covered with a great Number of Blood-Veffels; they are pretty big at the Bottom of the Womb, but

but they grow smaller and flatter, as

they approach the Os Pubis.

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The Spermatick Vessels in Women of the are four, as in Men; they differ only in Spermatick this, that they are shorter, that the Ar-Vessels. tery makes several Turnings and Windings as it goes down, that it divides into two Branches, of which the smallest goes to the Ovarium, the biggest divides into three more, of which one is bestowed upon the Womb, another upon the Vagina, and the third upon the Ligaments of the Womb and Tuba Fallopiana: "Tis the same as to the Vein.

The Ovaria are tied about two Fin-Of the Sigers Distance from the Bottom of the tuation Womb by the Ligamenta Lata. They and Fiare fixed to the Peritoneum at the Iliagure of the by the Spermatick Vessels. They are Ovariation of an Oval Figure, a little flat upon their upper part, where the Spermatick

Vessels enter.

The Ovaria or Testicles are near half of their as big as Mens are; their Surface is un-Memequal and wrinkled in Old Women, branes and but smooth and equal in Maids; they Substance, are covered with a proper Membrane, which sticks close to their Substance, and with another common from the Peritoneum, which covers all the Spermatick Vessels. Their Substance is composed of Fibres and Membranes, which

which leave little Spaces, in which there are feveral small Veficles, round, full of Water, which being boil'd, hardens like the White of an Egg; they have each of them two proper Membranes, upon which there are feveral: fmall Twigs of Veins, Arteries, and Nerves. These Vesicles are called Eggs, and they are of a different Size, and Number, in Women of different Ages. We observe in Cows, that fuch of them as are impregnated after Copulation, are contain'd or cover'd all over with a yellow Substance, which has a small Hole in its Side, through which they are thrust when they fall into the Tube Fallopiane. Besides the Spermatick Vessels, the Ovaria have Nerves from the Intercostals and Lymphaticks, which discharge themselves into the common Receptacle.

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Of the Tu- The Tubæ Fallopianæ are fituated on the bæ Fallo- right and left side of the Womb; they pianæ. rise from its Bottom by a narrow Beginning, and they dilate in form of a Trumpet to their Extremities, where they are contracted again into a small Orifice, from whose Circumference they dilate into a pretty broad Membrane, which looks as if it were torn at its Edges, therefore call'd Morsus Diaboli. Their Cavity, where they open

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into the Womb, will scarcely admit of a Hog's Bristle; but at its widest part it will take in the end of one's little Finger. Their Substance is composed of two Membranes, which come from the External and Internal Membranes of the Womb. The Tubes are about four or five Fingers breadth long; they have the same Veins, Arteries, Nerves and Lymphaticks, as the Ovaria. These are all the Parts of Generation in Women.

So great is the Pleafure in the Act of The Use of Generation, that it alters the Course of these Parts the Blood and Animal Spirits, which in Generathen move all the above described tion. Parts, which before lie quiet and at rest. The Clitoria is erected, which by its exquisite Sense affords a great deal of Delight; the Glands about the Neck of the Womb, being pressed by the fwelling of the neighbouring Parts, pour forth a Liquor to facilitate the Passage of the Yard, and to encrease the Pleasure. The Neck of the Womb contracts and embraces closely the Yard; the Fibres of the Womb contract and open its Mouth (which at other times is extremely close) for the Reception of the spirituous Part of the Seed; and the Branches of the Spermatick Artery which run upon the Ligamenta

gamenta Lata, between the Ovaria and the Tubæ Fallopianæ, being distended with Blood, contract and pull the Extremities of the Tubes to the Ovaria, for carrying the Seed to them. The Seed impregnates the Egg, which from being transparent, becomes opake some time after; 'tis cover'd with a thick and yellow Substance which presses it on all sides, and thrusts it out through a little Hole in its middle; so it falls into the Orisice of the Tubes, which dilate sufficiently for its Passage into the Womb.

Some, partly confidering the Clofeness of the Mouth of the Womb, and partly the Thickness of the Membranes of the Ovaria and Ova, do judge it impossible for the Seed to pass this way; therefore they think that it is taken up by the Veins which open in the Cavity of the Vagina and Matrix, where circulating, it ferments with the Mass of Blood; from thence come all thoseSymptoms which appear in Conception: It enters and impregnates the Egg by the fmall Twigs of Arteries which are upon its Membranes. This Fermentation Iwells the Membranes of the Tube, opens the Cavity of the Womb, and makes every thing ready for the Reception of the Egg.

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#### SECT. XVII.

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T.

Of the Generation of the Fœtus; Of the Umbilical Vessels; Of the Placenta: Of the Posture of the Fœtus, and Term of Delivery.

THE great and many Difficulties which attend the most plausible Account of the first Formation of the Parts of an Animal, and beginning of Motion in its Fluids; and the nice and curious Observations of Redi, Leeuwenboeck and others, have been sufficient Motives to most of the Moderns to throw off the Notion of Equivocal Generation. But though both Reason and Experiments convince us, that all the Parts of an Animal did exist, and its Fluids were in Motion before Generation; yet whether the Animalcule was lodg'd in the Seed of the Male or Female Ova, is Matter of Controverfy. The Arguments strongly alledg'd on both fides, perswade me of the Truth of what Dr. Garden says, that the Female Ovum is a proper Nidus for the Animalcula in semine. It is amazing to fee the prodigious Number of little Creatures like fo many Tadpoles swimming every way in the Male Sperm of all

The Generation of the Fœtus, &c.

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all Animals : Nor is it less curious to observe their languid Motion, in such as are poxed, and how they recover their former Briskness as the Distemper abates. Leeuwenhoeck tells us of one whose Wife for fome Years did not conceive, because there were no Animaleula to be found in his Seed, there being no other visible Hinderance on either fide. These Animals are so finall that 2000000000 of them are not equal to a Grain of Sand, whose Diameter is but the i part of an Inch. Whilst the Seed thus abounds with Animalcula, there are not the least Rudiments of an Animal to be feen in any part of the Ovaria: Yet these likewise have a principal Part in Generation, for without them there is no Conception; and even Bitches which have been spayed forget their usual Appetites, as if they were the only spurs to Venery. The yellow Substance which grows in the Ovaria of Cows, upon Conception, is very remarkable: It has a small Dint, and a Cicatrice in its middle, as if the Ovum had dropt out there, (as Malpighius thinks.) When the Fatus is very fmall, I have observ'd it very large; but as the Færus grows bigger and bigger, this decays, and, I think, at last, even vanishes: Nor is it to be feen

feen before Conception, and in one Teiticle only, when there is but one Calf. If all the Animalcula, or a great many of them, did fasten and grow to the Womb, till such time as by their Bigness, or want of Nourishment, they made one another drop off, (as Lecuwenhoeck thinks) Women could not but be sensible of their Evacuation, for they must be falling off, through the whole time of their being with Child. But when the Animalculæ gets into an Ovum fit to receive it, and this falls through one of the Tuba Fallopiana into the Womb, the Humours which distil through the Veffels of the Womb, penetrating the Coats of the Egg, swell and dilate it, as the Sap of Earth does Seed thrown into the Ground. Or else the Branches of the Veins and Arteries, whereby the Egg was tied in the Ovarium (which probably make the Umbilical Vessels) being broken, fasten with the Vessels of the Womb; then the Placenta begins to appear like a little Cloud upon one fide of the External Coat of the Egg; and at the same time the Spine of the Embryo is grown fo big, as to be visible; and a little after the Cerebrum and Cerebellum appear like two small Bladders, and the Eyes next stand gogling out of the Head; then

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The Generation of the Foetus, Oe. then the beating of the Heart, or Pun-Elum Saliens, is plainly to be feen; and the Extremities discover themselves

last of all.

Of the Chorion.

Now the Membranes which involve the Fætus are the same with the Coats of the Egg. The External is call'd Chorson; it is pretty thick, and a little rough on its outfide, to which the Placenta adheres. It embraces immediately the Amnion, or Internal Membrane, which is a fine and delicate Bag full of a clear Liquor, in the middle of which the Fætus swims. This Liquor is separated, for the Nourishment of the Fatus, by the Glands of the Amnion, from its Blood-Veffels, which are fine Branches of the Umbilical Vein and Arteries.

The Arteries rife from the Extremity of the Aorta, or the Beginning of the Iliacks of the Fætus; and passing by the fides of the Bladder to the Navel, through which they pass, they give fome Branches to the Amnion and Chorion, and are afterwards divided into an infinite Number of Branches in the Placenta. The Vein rifes by feveral Roots or Branches which are spread thro'all the Substance of the Placenta; it enters the Chorion and Amnion, to which it gives feveral Twigs; and paf-

Of the Amnion.

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The Generation of the Foetus, &c.

fing in at the Navel, it joins the Vena

Porta, in the Substance of the Liver.

The Umbilical Vessels between the Navel and the Placenta are wrapt up in a Production of the Chorion and Amnion, which is generally about a Foot and an half long, that the Motion of the Fætus might not pull the Placenta from the Womb. The Use of this The Use Navel-string, is to carry the Mater-of the Naval Blood by the Veins to the Fætus, vel-string, for its Nourishment: That which is unsit for this Use, is carried back by the Arteries to the Placenta, whilst the Fætus is still supplied with more by the

Vein; so that there is a continual Cir-

Culation betwixt the Mother and the Fatus.

Now the Placenta is a thick Cake of the

which grows upon the outside of the Placenta. Chorion, in Proportion as the Fatus grows; it is of a circular Figure, at its biggest it is about two Fingers breadth thick, and six or seven in Diameter. The Branches of the Umbilical Vessels are spread through all its Substance; and indeed, it seems to be nothing else but a Texture of the Vein and Arteries, by whose Extremities opening into the sides of the Hypogastrick Vessels, the Circulation is perform'd between the Mother and the Fatus; for that

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enta; , to l paffing fide of the Placenta which adheres to the Womb, appears to be nothing but the Extremities of an infinite Number of small Threads, which, in Labour, dropping out of the Pores in the sides of the Hypogastrick Blood-Vessels, into which they had infinuated themselves, is the occasion of the flowing of the Lochia, till the Uterus collapses, or the Pores, by the natural Elasticity of the Vessels, contract by Degrees. Sometimes Twins have only one common Placenta, and sometimes

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they have each a distinct one.

Besides these Membranes which involve the Fætus, there is another, which lies between the Chorion and the Amnion, on the opposite fide to the Placenta, in the form of a Bag, called the Allantors, it receives the Urine of the Fætus from a Pipe called the Urachus, which rifes from the Bottom of the Bladder, and passing out at the Navel, to which place its Cavity is very apparent, but hardly to be perceived afterwards in the Umbilical Rope, tho' there are not wanting some good Anatomists who have observed it even there. However its being rarely found, has given ground to many Anatomists, to doubt of the Existence of the Human Allantois its self, the Opportunities of to

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of opening the dead Bodies of Women big with Child being very rare. if we confider, that there feems to be the same Necessity for the Secretion of the Urine of the human Fætus, that there is for that of Brutes, and that we actually find Urine in the Bladder of the first, as well as of the last, we cannot doubt, but that Nature would provide for the one, as well as for the o-And that she really has done to, we may gather from this, that Midvives do generally observe two different forts of Waters to come away in Labour. And I have feen a Human Allantois with all the Secundines curioully prepared by Dr. Hale, of which he has given a full Account in the Philosophical Transactions.

The Fætus is almost of an Oval Fi-Of the Pogure whilst it lies in the Womb, for sture of the
its Head hangs down with its Chin Fætus.
upon its Breast; its Back is round;
with its Arms it embraces its Knees,
which are drawn up to its Belly; and
its Heels are close to its Buttocks, its
Head upwards, and its Face is towards
its Mother's Belly. But about the ninth
Month, its Head, which was always specifically lighter than any other part, becomes specifically heavier, its Bulk
bearing a much smaller Proportion to

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its Subflance than it did, and confequently it must tumble in the Liquor which contains it; so its Head falls down, its Feet get up, and its Face turns towards its Mother's Back : but because then it is an irksome, though favourable Posture for its Exit, the motion it makes for its Relief, gives frequent Pains to its Mother, which caules a Contraction of the Womb, for the Expulsion of the Farus. When the Child presents in any other Posture, it should be carefully put back again, and, if possible, turn'd to the right way : If that can't be done, it should be brought out by the Feet.

### CHAP. III.

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Of the Thorax, or middle Cavity.

SECT. I. bins Will Of the Breafts.

hrees.

Aving already described the Figure, Bounds, and External Parts of the Thorax, we come now to examine the Substance and Use of its feveral Parts; among which, the first that presents it felf is the Breafts. The

The Substance of the Breasts is composed of a great Number of Glands of an oval Figure, which lie in a great Quantity of Fat. Their excretory Ducts, as they approach the Nipple, join and unite together, till at last they form feven, eight, or more small Pipes, call'd Tubuli Lastiferi, which have feveral cross Canals by which they communicate with one another, that if any one of them be floor, the Milk which was brought to it might not stagnate, but pass thro' by the other Pipes, which all terminate in the Extremity of the Nipple.

The Nipple is a spongious Substance made of two Orders of Fibres: The fmallest make a fine Net-work within the larger Spaces of the Net-work of the bigger Fibres. Through it pass the Tubuli Lastiferi, which grow smaller and fmaller to their Extremities, that the Milk might not run out but when the Breasts are full, or upon Suction: It has an exquisite Sense, and a small Ere-

ction when it is handled. The Arteries and Veins of the Breasts are Branches of the Subclavian and Intercostal. They have Nerves from the Vertebral Pairs, and from the fixth Pair of the Brain.

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The Use of the Breasts is to separate the Milk for the Nourishment of the Fairs. The Tubes which compose the Glands of the Breasts in Maids, like a Sphincter Muscle contract so closely, that no part of the Blood can enter them : But when the Womb grows big with the Fætus, and compresses the defcending Trunk of the great Artery, the Blood flows in a greater Quantity, and with a greater Force through the Arteries of the Breasts, and forces a Passage into their Glands, which being at first narrow, admits only of a thin Water; but growing wider by degrees, at the Womb grows bigger, the Glands receive a thicker Serum; and after Birth they run with a thick Milk, because that Blood which before did flow to the Fætus, and for three or four Days afterwards by the Uterus, beginning then to stop, does still more dilate the Glands of the Breafts.

The Breasts in Men are very small, they are chiefly for an Ornament. I have seen some Men who have had Milk

in them.

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#### SECT. II.

Of the Diaphragma, or Midriff.

Under the Breasts lie the Muscles and Bones which compose the fore-part of the Thorax; these are described in their proper Places: Having therefore cut them up, and laid the Cavity of the Thorax open, the Diaphragma, Pleura, Mediastinum, Heart and

Lungs appear.

The Diaphragma is composed of two of the two Muscles, which divide the middle from Muss les the lower Cavity. The first and su-which come perior Muscle arises from the Sternum, pose the and the Ends of the last Ribs, on each Midriff. fide. Its Fibres, from this semi-circular Origination, tend towards their Centre, and terminate in a Tendon or Aponeurofis, which hath always been taken for the nervous part of the Midriff. The second and inferior Muscle comes from the Vertebre of the Loins, by two Productions, of which that on the right fide comes from the first, second, and third Vertebra of the Loins; that on the left fide is somewhat shorter; and both these Productions join and make the lower part of the Midriff, which joins its

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126 Of the Diaphragma, or Midriff.

Tendon with the Tendon of the other, fo as that they make but one Membrane,

or rather Partition.

The Midriff is cover'd with a Membrane from the Pleura on its upper fide, and by the Peritonaum on its lower fide; it is pierced in its middle, for the Palfage of the Vena Cava; in its lower part, for the Oesophagus; and the Nerves which go to the upper Orifice of the Stomach, and betwixt the Productions of the inferior Muscle, passes the Aorta, the Thoracick Duct, and the Vena Azygos.

Of its Vef- The Midriff receives Arteries and fels.

Veins call'd Phrenica from the Cava and Aorta; and sometimes on its lower part two Branches from the Vena Adiposa, and two Arteries from the Lumbares. It has two Nerves which come from the third Vertebra of the Neck, which pass through the Cavity of the Thornes, and are dispersed in the Muscles of the Mid-

riff.

of its Use. The Midriff, in its natural Situation, is Convex on the upper fide towards the Breast, and Concave on its lower fide towards the Belly: Therefore when its Fibres swell and contract, it must become plain on each fide, and consequently the Cavity of the Breast is enlarged, to give Liberty to the Lungs

Lungs to receive the Air in the Inspiration; and the Stomach and Intestines are pressed for the Distribution of the Chyle; but it diminishes the Cavity of the Breast, when it resumes its natural Situation, and presses the Lungs, for the Expulsion of the Air in Expiration.

# and an S.E.C.T. III.

of the Pleura, Mediastinum, and Thymus.

THE Pleura is a double Membrane of the which covers all the Cavity of the Pleura. Thorax; it arises from the Vertebrae of the Back, ascends on each side upon the Ribs to the middle of the Sternum. It is fixed to the Periosteum of the Ribs, to the internal intercostal Muscles, and it covers the Midriff. It's side towards the Cavity is smooth and equal, but that which is fixed to the Ribs is rough.

The Mediastinum is a double Mem-Of the Mebrane, formed by the Continuation of diastinum the Plana, which comes from the Sternum, and goes straight down through the middle of the Thorax to the Vertebra, dividing the Cavity in two. It contains, in its doubling, the Heart in its Pericardium; the Vena

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Cava, the Oefophagus, and the Stomachick Nerves. The Membranes of the Mediastinum are finer and thinner than the Pleura, and they have a little Fat. The Mediastinum receives Branches of Veins and Arteries from the Mamillary and Diaphragmatick, and one Proper, call'd Mediastina; its Nerves come from the Stomachick; it has also some Lymphaticks, which open into the Thoracick Duct. The Mediastinum divides the Thorax into two Parts, to the end that one Lobe of the Lungs may officiate, if the other be hindred by a Wound on the other fide of the Thorax. Sometimes there is a Matter contained betwixt its Membranes immediately under the Sternum, which may occasion the Trepaning of this Place.

Of the Thymus.

The Thymus is a conglobate Gland, fituated in the upper part of the Thorax under the Clavicula, where the Cava and Aorta divide into the Subclavian Branches. This Gland is big in Infants, but as they grow in Age, it grows lefs. Its Arteries and Veins are Branches of the Carotides and Jugulars. It has Nerves from the Par Vagum, and its Lymphatick Veffels discharge themselves in the Dustus Thoracicus.

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Of the Pericardium, Hart, &c.

The learned Dr. Tylon supposes the Use of this Gland to be for a Diverticulum to the Chyle in the Thoracick Duct of a Fatus, whose Stomach being always full of the Liquor in which it swims, must keep the Thoracick Duct distended with Chyle; because the Blood which the Fætus receives from the Mother fills its Veins, and hinders the free Entrance of the Chyle into the Subclavian Vein. Nor can any Argument be drawn from the Valves in the Lympheducts of the Thymus, against this Opinion; for I have more than once inje-Eted them with Was up to the Thymus, by the Thoracic Duct, as Mr. Cowper likewise observes.

#### S E.C.T. IV.

Of the Pericardium, Heart, and its

THE Pericardium is a thick Mem-Of the brane of a Conick Figure, it re Pericardifembles a Purse, and contains the Heart um. in its Cavity. Its Basis is pierced in five Places, for the Passage of the Vessels, which enter and come out of the Heart; It lies in the Duplicature of the Mediastinum, which sirmly adheres to it, as its Point does to the mid-

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Of the Pericardium, Heart, &c. 130

middle Tendon of the Midriff. It receives its Vessels from the Mammary and Phrenica, Nerves from the Recurrent and Diaphragmatick. It has Lymphaticks which discharge themselves in the Thoracick Duct.

The Use of the Pericardium is to con-O the Watain a spoonful or two of a clear Water, ter conwhich is separated by some small Glands tained in the Periin the Pericardium, that the Surface of cardium. the Heart may not grow dry by its con-

tinual Motion.

tuation.

Figure.

Of the Si-The Heart is fituated in the middle of the Thorax, between the two Lobes of the Lungs, it is of a Conick Figure, and Conwhose Basis is the upper end, and its e'e Heart. Apex or Point is the lower end, which is turned a little to the left fide, that the right Auricle may be lower than the left; by which means the refluent Blood in the Cava ascends the more eafily; for, like other Liquors, the Blood will rife to the same Height in both Legs of a reflex Tube. For the fame Reason, the Aorta runs first upwards, before it turns down, that the Force of the returning Blood from the lower Parts may be the greater.

> The Heart is tied to the Mediastinum, to the Pericardium, and fustained by the great Veffels which bring and carry back the Blood. It is cover'd by a

Mem-

Of the Pericardium, Heart, &c. Membrane, which is the proper Membrane of the Mulcles; it's Bafis is always furrounded with Fat. It has two Veins, which open into the Cava, imme-Of its Vefdiately before it empties it felf intofels. the Auricle, and they are accompanied with two Arteries from the Aorta, which run through all the Substance of the Heart, they are call'd the Coronary Veffelo. The Arteries bring the Blood for the Nutrition and Motion of the Heart, and the Veins carry back what remains. The Branches of the Veins con the right Side communicate, with those of the Left. In like manner do the Arrates of each Side communicate with one another ! and it is the fame. though not every where fo evident, in all the Parts of the Body. The Heart receives a multitude of small Nerves from the Eighth Pair, particularly they creep in great Numbers about the Aorta, and on the left Ventricle. It has also some Lymphaticks, which discharge themselves in the Thoracick Dastricken daidh anfwer estrertre

At the Basis of the Heart there . e Of the Austwo Auricles or little Ears, one on the riculæ. eight, the other on the lest Side. In the right Ear opens the Vena Cava, in the lest the Vena Pulmonalis: The first discharges the Blood that it receives

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from the Cava into the Right Ventricle, and the fecond thrusts the Blood that comes from the Vena Pulmonalis into the left Ventricle. The Left is less, but thicker than the Right. Their Subflance is composed of two Orders of Mufeular Fibres, which terminate in the Tendon in the Bafis of the Heart'; and at the right Ear there is a Circle like to a Tendon, where the Cava ends. Their External Surface is smooth; their Internal is unequal, full of small fleshy Pillars, which fend out small Fibres, that cross and go thwart one another; and betwixt these Pillars there are as many Furrows; they receive Nerves from the Branches of the Eighth Pair. They have the fame Motions of Syffole and Diaftole as the Heart, which we shall

Their Use. explain afterwards. Their Use is to receive the Blood which is brought by the Vena Cava and Pulmonalis, and by them to be thrust into the Ventricles of the Heart.

Of the Ventricles of the Heart.

In the Heart there are two Cavities or Ventricles, which answer to the two Ears, one on each side; the sides of these Cavities are very unequal, full of Fibres and little sleshy Productions, long and round, of a different Figure and Bigness, call'd Columna or Pillars. Betwint these Fibres there are several

Fur-

Of the Pericardium, Heart, &c.

Furrows in the fides of the Ventricles: especially in the left Ventricle, they are deeper and larger; they contribute much to the close Contraction of the Ventricles. And because the fide of the right Ventricle is much thinner than the left, therefore there is often a small Bundle of fleshy Fibres, which come from the middle Partition to its opposite side, to hinder it from dilating too much.

The Right Ventricle feemeth wider than the Left, which is longer and narrower than the Right, and its fides ftronger and thicker. The two Ventricle are separated by the Septum Medium, which is properly the Infide of the left Ventricle, being its Fibres are continued with the Fibres of the opposite side of the same Ventricle. The Vessels which enter and come out of the Heart are the Vena Cava, the Arteria, and Vena Pulmonalis, and the Aorta or Arteria Magna.

The Right Ventricle receives the Of the Blood from the Vena Cava, through the Right Ventright Ear; and at the Mouth of the tricle, and Ventricle there are placed three Valves, of its made of a thin Membrane; they are Valves. of a triangular Figure, and are call'd Tricuspides; their Bases are fixed to the Mouth of the Ventricle, and their Points

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Points and Sides tied by finall Fibres to the fleshy Productions. So that when the Ventricle contracts, and the oppofire Sides approach one another, the Points of the Valves meet, and their lateral Strings being relaxed, their Sides are likewife made to join one another by the Blood which gees between them and the Sides of the Ventricle; the three Valves thus united form a concave Cone, which hinders the return of the Blood to the Auricle. It is therefore thrust out at the land and

Of the the Arteria Pulmonalis.

The Arveria Pulmonalis, which rifes Valves of immediately out of the Right Wentilcle; its Mouth is less than the Cava; it has three Valves, call'd Sigmoidales, or Semilunaries, because they resemble a Half-Moon, or the Greek Sigmay which was write thus C. Their Subilance is Membranous. When they feparate, they give Paffage to the Blood, from the Ventricle into the Artery; but they flut the Passage, and are thrust together by the Blood, if it endeavours to return. The Arterid Pulmonalis carries flie Blood to

Of the the Left Ventricle.

The Vena Pulmondin, which discharges Values of it felf through the left Ear into the Ventricle of the same Side. At the Orifice of this Ventricle there are two Valves call'd Mitrales, because they refemble a Mitre; they are broader

than

Of the Pericardium, Heart, &c.

than the other Valves; they are fituated, and have the fame Ufe as the Trycuspides in the Right Ventricle.

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The Aorta, or Great Arrery, rifes immediately out of the Left Ventricle;

it has three Valves, which have the Of the fame Use and Figure as the Semilunaries Valves of in the Arteria Pulmonalis.

The Heart is a compound Muscle; Of the Subits Substance is made of Fibres of the stance of same Nature as those of other Muscles: the Heart, There are several Orders of them, which and of the have different Directions, and all their Order of Tendons are in the Basis of the Heart its Fibres. From the Aorra, just by one of the Coronary Arteries, go out two Tendons, of which the first passes between the

of which the first passes between the Pulmonary Artery and the right Auricle, the other between the two Auricles; these surround the Entry both of the Aorta and Lest Ventricle. The Entry of the Right Ventricle is likewise Tendinous, but all the Fibres which terminate about the Pulmonary Artery,

Now of the Fibres which come from the Mouths of the Right Ventricle and Pulmonary Artery, the outermost, which are much the finest, go in a straight Line to the Point of the Heart. All the other which are next the Surface or the Heart wind towards the left Hand, till they

arrive

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Of the Pericardium, Heart, &c.

arrive at the Point, where sturning underneath themselves, and under the Right Ventricle, they wind upon the Left Ventricle, towards the right Hand, to their Infertion in the Basis. Under the straight Fibres, there pass a few more, almost straight, from the Mouth of the Right Ventricle, to the Pulmonary Artery: and from the opposite fide of the Artery, to the second Tendon of the Aorta, there pass others, by both which the Mouth of the Pulmona-EV Artery is dilated in the Contraction of the Heart. Under all these, some, which wind from the first Tendon of the Aorta towards the Point, when they come to the middle of the Right Ventricle, turn up again to the Root of the Pulmonary Artery, on terminate in the fleshy Pillars and Papilla. These both contract the Ventricles, and dilate the Arteries at the same time. The Mouths of the Ventricles are likewife furrounded with semicircular Fibres, which affift the Valves in the Syflole of the Heart; on the fide of the Septum Medium, which is next the Right Ventricle, some Fibres go straight from the Basis to the Apex. All the rest of the Fibres are twisted only round the left Ventricle, and of thefe fome creep half way, fome more than half

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Of the Pericardium, Heart, &c. half way, and then return to the Basis by the opposite fide; some again terminate in the Fleshy Pillars and Papille; the rest turn the Point, and feen to me to involve the Heart, more than once in their going from, and returning to the Basis. From hence it appears, that a much greater Number of Fibres involve the Left Ventricle, than do the Right, being the Blood is by this thrust only through the Lungs, but by that, through all the Parts of the Body, even to the Extremities, and back again. And that the Force of the Constriction of this Ventricle, might be every where frong, and the Texture of the Heart it self firmer, these Fibres are not at all parallel, or they do not all run with the fame Obliquity, but the inner always decuffate the outer, and frequently mix with one another. The Bone which is found in the Basis of the Hearts of several Beafts, is nothing but the Tendons of the Fibres of the Heart offify'd: It is cometimes found in Men.

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This Muscle has two Motions; Of the Sywhich they call Systole and Diastole stole and The Systole is when the Fibres of the Diastole Heart contract, its Sides swell, and of the its Cavities are strongly press'd on all Heart. Sides. The Diastole is when this Mus-

cle

Of the Pericardium, Heart, &c. 138

cle cenfeth to act; its Fibres are lengthned, its Sides fall, and its Cavities be-

come large and wide!

Of the Cir- Having describ'd the Heart and its culation of Parts, let us now confider the Circulathe Blood tion of the Blood, which is perforthrough the med by means of this Muscle. The Heart.

Vena Cava Ascendens and Descendens unite in one, and open into the right Ear, where they unite; there is a little Protuberance made by their Coats on the Infide of the Canal like an Ifthmus, which directs the Blood both of the one and the other into the Ear, and fo hinders them from rushing one upon a nother. The right Ear in its Diaftel receives the Blood from the Vena Cava, which by its Systole is thrust into the right Ventricle; (for the tendinous Circle which is at the Mouth of the Cava, contracts, and hinders the Blood to refurn into it) which at the fame time is th its Diaftole. In the Syftole of the right Ventricle the Blood is thrull into the Arteria Paimonalis, for dit cannot return into the Ear, because of the Paloula Price Dides ) which I com municates with the Vend Pulmonalis which carries back the Blood into the left Ear, which in its Syftole thrusts the Blood into the left Ventricle, which is then in its Diaffole. In the Sylene of

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this Ventricle the Blood is thrust into the Aorta, (for it cannot return into the Ear, because of the Valvula Mitrales) which carries it through all the Body. Now the Aorta, when it comes out of the Heart, ascends a little upwards, and then turns downwards to form the defcending Trunk, for the Reason already given ; and from the upper fide of this Turning the Cervical and Artillery little Vessels do arise; by this Artifice the ds on Blood collides against the sides of the thmus, Aorta; its Force is broken, part of it is ne one taken in by the Mouths of the ascendnd fo pon a ing Branches, but its greatest part is directed downwards. Diuftole Cava,

Let us now confider which way the Of the Cirto the Blood circulates in the Farus; for this culation of dinous ou must observe, that in the right Ear, the Blood on the lower fide of the Proruberance in the of the Cava, just opposite to the Mouth Fœtus. of the Cava Ascendens, there is a Hole oftole of tall'd the Poramen Ovale, which opens inthrult to the Vena Palmonalis; this Hole has a Valve, which fuffers the Blood to ener the Vein, but hinders it to come ack again. There is likewife a Pall age or Canal which runs from the Trunk of the Arteria Pulmonalis to the Trunk of he Aorta.

Now the Blood which comes from he Placenta, by the Umbilical Vein, into Of the Pericardium, Heart, &c.

into the Vena Porta, is fent into the Cava by a Canal which goes straight from the Trunk of the Porte to the Trunk of the Cava in the Liver. This ascends the Vena Cava, and is directly thrown through the Foramen Ovale, into the Vena Pulmonalis, which carries it into the Left Ventricle, which throws it into the Aorta, to be distributed through all the Body. But the Blood which comes down the Vena Cava defeendens is diverted by the Isthmus of the Cava, from the Foramen Ovale, and falls into the Right Ventricle, which thrusts it into the Arteria Pulmonalis, from whence part of it is immediately carried by the communicating Canal into the Aorta. The Reason of these Passages in a Fætus, was, because the Blood could not all pass through the Pulmonary Blood-Veffels, they being too much compressed by the Substance of the Lungs; but as foon as the Child is born, and the Pressure is taken off from the Blood-Veffels by the diftention of the Lungs with Air, the Blood finding a free Paffage through the Lungs, runs no more by the communicating Canal, whose Direction likewife is not now fo favourable for its Reception as before; because the Pulmonary Artery being stretched out with

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Of the Pericardium, Heart, &c. with the Lungs, makes it go off at right Angles, and therefore it dries up. And now the Pulmonary Veins being distended with the greater Quantity of Blood which it receives from the Lungs, the Valve of the Foramen Ovale is prefied close to its Sides, denying a Passage to the Blood from the Cava, to be mixed with the rest of the Blood. By this you fee, that the Blood which comes from the Vena Cava Descendens, paffes only through the Left Ventricle, whilft the Blood which comes from the Cava Ascendens paffes only through the Right Ventricle. On the do man or mind we conk

From what has been faid, it appears, that both Auricles contract at the same time, as likewise do the Ventricles; and that when the Auricles are contracted, the Ventricles are dilated, & vice versa. To account for this alternate Motion of the Auricles and Ventricles of the Heart, we must confider that the Contraction of all Muscles is caused by the influx of the Blood and Animal Spirits into the Cavities of their Fibres; and therefore whenever this ceaseth, the Contraction of the Muscles likewise ceaseth, or the swelling of the Fibres abating, they may be reduced by any small Force to the same Length they were.

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were before their Contraction, which alone is their natural State, the other being entirely caused by an external Force. If therefore there be an equal, and continual Influx of the Blood and Animal Spirits, the Contraction of the Muscles will likewise be equal, and continual; and if the Influx is unequal and interrupted, the Contraction will be the fame. What this Influx is, will best appear from the Action of fuch Muscles, as have no Antagonist, and over which our Will has but a fmall Influence; the most principal of which are the Heart and the Muscles which dilate the Thorax in Inspiration. Now both these are alternately dilated and contracted, and confequently the Blood, or Animal Spirits do not flow continually into their Fibres, but at small Intervals of Time, to which these Contractions answer. That they have no Antagonist Muscles, is evident to every one who is acquainted with the Structure of the Body, for the Muscles, which in a quick Expiration accelerate the Motion of the Ribs downwards, are fo weak, as to be of no moment; and that the Pressure of the Atmosphere upon the Surface of our Bodies cannot Supply the Place of Antagonist Muscles,

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is as apparent to any one who confiders, that the Air within us is always in aquilibrio with the Air without us, and confequently the Pressure of the Atmosphere can neither promote nor retard the Contraction of the Thorax, or the Dilatation of the Heant; and there beng no other thing which can influence them, their alternate Contractions, ind Dilatations, must be owing to the nflux of the Blood or Animal Spiits. There are indeed other Muscles, which have no Antagonists, such as he Sphineter, Gule, Ani, and Vefice, which we do not observe to be thus alternately relaxed and contracted; out the Reason of this is, because their force is very weak, and confequently heir Contraction small, and differing o little from their Relaxation, as to e imperceptible to us, and perhaps n the ordinary Course of Nature, they ct no other ways than the Fibres of he Arteries do, which when they are ilated by the Blood, by their innate lasticity contract again. It may peraps be objected, that when one fide f the Face is struck with a Palsey, he other is constantly and incessantly onvulsed, and that therefore the Inux of the Blood and Spirits must be ontinual. But to this I answer, that when

when the Swelling which caufeth the Contraction of the Fibres, fubfideth, and the Muscles are relaxed, they will still be shormed, till by some small Power they are pulled out to their natural Length, which being here wanting, and one Contraction presently following another, that fide of the Face will always appear as if incelfantly convulfed. But the natural bent of the Ribs is downwards, by which the Intercostal Muscles are street ched out again, as well as by the weak force of their few Antagonists And when the Fibres of the Heart are relaxed, they are, by the Influx of the Blood into the Auricles and Ventricles distended again till the next Contraction.

And that the Muscles are not in a perpetual State of Contraction, will likewise appear from the Nature of the Cause of their Contraction, which exists without doubt is the Rarefaction of the Blood and Spirits in the Cavities of the Muscular Fibres. Now of the Muscular Fibres. Now of the Muscular Fibres. Now of the whatever Nature we conceive this Rarefaction to be, it can be but temporary, and must quickly cease in such he a small Quantity of Fluids, as the perfect of a Muscle, or rather, as one I Vesicle uf a Fibre, is capable of reinforceiving

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ceiving at a time. Nor will it be of any use to affirm, that there is a constant Supply of fresh Blood and Spirits, which keep up the Instation of the Fibres; for this Instation being caused by the Pressure of the rarified Fluids against the Sides of the Fibres, whilst this Pressure continues, the progressive Motion of the Fluids through the Fibres must be at a stop. hor can they move forward again, till by the s, till the Fibres are relaxed, and confequently the Contraction on of the Muscle must cease, before resh Blood can be rarified. I have inisted the longer upon this Point, beause I think it has never been sufficintly cleared, and if duly confidered, it not in will be found of use in explaining some

not in the vill be found of use in explaining some on, will part of the Animal Occonomy.

Being both Blood and Spirits are equired for the Inflation of the Cavities Blood moves with a continued Stream, Now of the Animal Spirits must only drop this Ramom the Nerves into the muscular libres, and there rarify the Blood after in such the manner we have explained in as the peaking of muscular Motion. When it, as one Drop falls, the Fibres are presently r, as one Drop falls, the Fibres are prefently le of renflated, and the Muscle contracted;

as foon as the Rarefaction of the Blood is over, the Muscle is relaxed till the next Drop falls from the Nerves, by which it's contracted again. Thus the Systole and Diastole of the Heart regularly and alternately follow one another, and this being first clearly understood, it will be easy to give a Reason why the Auri cles are conffantly contracted when the Ventricles are dilated, and the Ventri cles contracted when the Auricles an dilated, notwithstanding they have all the fame Nerves and Blood-Veffels For suppose all of them full of Bloo before the Heart begins to beat, an that the Auricles and Ventricles are redy to contract at the same time, yet be cause the Strength of the Ventricles much greater than that of the Auricle they will contract; and by their Co traction, hinder that of the Auricle which endeavour likewife to expel th Blood by which they are distended, be cannot perform it till the relaxation the Ventricles makes room for its Re ception; thus their Motions necessaril become alternate.

Salt and Spirits, some Phlegmand Supphur, a little Earth, but little or a partial salt. Alcali's dissolve it, as fit

Acids coagulate it

SECT

## SECT. V.

Of the Velocity and Quantity of the Blood.

HAving shewed which way, and by what means the Blood circulates through the Heart, we shall next inquire with what Velocity it moves.

The Ventricles of the Heart are each capable of receiving an Ounce of Blood. or more, and therefore being full in their Diastole, we may suppose that they throw out at least one Ounce of Blood each Suffole. The Heart contracts about 4000 Times in an Hour, more or less. according to the different Temperaments, Sexes, and Ages; and thereforethere passes through the Heart every Hour 4000 Ounces, or 250 lib. weight of Blood. Now the common Opinion is, that the whole Mass of Blood does not exceed 25 lib. and therefore accordxation ( ing to this Allowance, a Quantity of rits Re Blood equal to the whole Mass, passes ecessari thro' the Heart 10 Times in an Hour, that is, about once every fix Minutes. Volatil If the Heart contracts 80 Times in a n and Su Minute, then 25 lib. weight of Blood tle or passes through its Ventricles, once in it, a five Minutes, or 12 Times in an Hour.

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Of the Velocity and

Now having the Number of Pulses in any determinate time, the Quantity of Blood thrown out at the left Ventricle of the Heart every Pulse, and the Diameter of the Aorta, it will be easy to find with what degree of Celerity the Blood moves through the Aorta: For the Celerity with which a Fluid runs out at any Orifice, uniformly, and always running in the Same Quantity, is equal to the Velocity of a Body, which describes a Space of the same Length with that of a Cylinder, whose Basis is equal to the Orifice, and whose Magnitude is equa to the Quantity of the Fluid that run out in the same time. Now suppose the Heart contracts 80 times in a Minute, and that each Systole throws into the Aorta an Ounce of Blood, which is e qual in Bulk to 1,659 Inches, and consequently 80 Ounces are 132,74 Inches. The Diameter of the Aort I have found to be 0,73 Parts of a Inch, and therefore its Orifice is 0,4187 by which if 132,72 be divided, the Quotient 316 Inches, or 26 Feet gives the Length of a Cylinder, or the Space through which the Blood move in a Minute, supposing it were con stantly going out of the Heart with the same Velocity: But because of the Diastole of the Heart, which is a leaf

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least half the time of a Pulsation, there goes out 80 Ounces in half a Minute, and consequently the Velocity of the Blood is double, or it moves at the rate of 52 Feet in a Minute.

Now because the Sum of the Sections of the Branches of an Artery, is always greater than that of the Trunk, the Velocity of the Blood must constantly decrease as the Artery Branches. The exactest Proportion of the Branches to their Trunks, which I have lately found by measuring an Artery of the Thigh, injected with Wax, by that excellent Anatomist Mr. Cowper, is as 12387 to 10000; and consequently, from what I have elsewhere demonstrated, the greatest Velocity of the Blood will be to the least as 5233 to 1, or the Blood moves 5233 times flower, in some Capillary Arteries than it does in the Aorta.

The Blood is received from the Arteries into the Veins, where it still moves flower as it returns to the Heart again. The Arteries are to the Veins as 324 to 441, and consequently the Blood moves in the Veins above 7116 times flower than it does in the

Aorta.

The further the Blood moves from the Heart, the flower it returns, and H 2 all all the Blood which at the same Time is thrown out of the Heart, does not return at the same time to it again, but the Times are directly as the Spaces, the Blood runs over before it returns to the Heart again, and reciprocally as the Velocities; and consequently some Parts of the Blood may be some thousand Times longer in returning to the Heart than others, and there is no Time when all the Blood can be said to have

only once circulated.

But if there were any such Time, the Quantity of the Blood in the Body must be first determined, which I do not find to be agreed upon by Authors, some affirming that there is but 10, others 15, 20, and 25 Pounds weight of Blood in the whole Body. It is a very difficult thing, if at all possible, to determine the just Quantity of Blood in any Animal Body. That bleeding to Death can never give any Estimate which shall be near to the true Quantity, is almost Demonstration; for no Animal can bleed longer than the Great Artery keeps full, which will be a longer or shorter time, as the Artery wounded is smaller or greater, and the Aorta must always be the first Vessel that empties.

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The only way that I know, by which we can come to a nearer Knowledge of the Quantity of the Blood, is by finding what Proportion the Cavities of the Vessels (of which the whole Body is composed) bear to the Thickness of their Coats. This in the Veins and Arteries may be exactly found; but in the other Veffels we only know the Quantity of Fluids they contain, by carefully evaporating as much of their Fluids as we can. Thus I find the Fluids are to the Veffels.

The least of these Proportions shows the Liquors to be one half of the Weight of the Body, and if we calculate upon the Proportion of the Blood in the Arteries to their Coats, in a Body weighing 160 Pound, there will be found a 100 Pound of Blood. In this Calculation I have comprehended all the Liquors in the Body; but all of them besides the Blood, have been generally thought of fo small a Quantity, that the whole Body has always passed H 4 for

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for folid, excepting the Blood: And indeed, all the Fluids in the Body are either Blood, or Parts of the Blood, moved by the Force of the Heart, contained in Veffels continu'd from the Arteries, and as useful to Life as the Blood; and therefore I think in this Inquiry not to be distinguished from it, and whoever would make a right Judgment of the Strength of the Heart, must calculate the Quantity of all the Fluids moved by it; or whoever would form a right Idea of the Animal Oeconomy, must know the Quantity of all the useful Fluids, as well as of the Blood. And must not our Idea of it, when we confider the Body as composed mostly of Fluids, be very different from that, which a Body confisting mostly of solid Parts, and not above one tenth part fluid, gives us ?

#### SECT. VI.

Of the Lungs. .

Of the Fi- THE Lungs are in the middle of the gure of the Cavity of the Thorax; they are Lungs. divided into two Lobes by the Media-finum; and the left is ordinarily subdivided into two more. The Figure of both

both Lobes together refembles a Cow's Foot, being a little Concave betwixt the two Lobes, where they embrace the Heart, and behind, where they lie upon the Vertebræ; but before, where they touch the Sternum and Ribs, they are convex. The Colour of the Lungs Of their in a Fatus, is of a pale Red; but after Colour and the Air has once enter'd them, they lofe Connexion. their Red, and remain always pale; yet in Adults they are variegated with the one and the other. They are tied to the Sternum by the Mediastinum before, to the Vertebra by the Pleura behind, where it rifes from the Vertebra to the Heart by the Vena and Arteria Pulmonalis, and sometimes to the Pleura, where it covers the Ribs, particularly in the left Side, and especially after a Pleurify.

The Lobes of the Lungs are covered of the with a double Membrane; the External Mema Production of the Pleura; the Inter-branes of nal not only covers immediately the the Lungs. Subflance of the Lungs, but its inner Lamina fills up the Interstices which are between the Bunches of the small Lobes with little Vesicular Cells: The fine Capillary Blood-Vessels are so thick upon this Membrane, that it seems to be nothing but a Net-work of Veins and

Arteries.

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Of the Structure of the Lungs.

The Substance of the Lungs is composed of an infinite Number of little Lobes of various Figures and Magnitudes; but their Surfaces are so adapted to one another, as to leave but very few and small Interstices. These Lobes are disposedlike so many Bunches of Grapes upon the Sides of the Bronchi. Each little Lobe contains within its own proper Membrane, an infinite Number of Imall and little Orbicular Veficles, which leave small Interstices between them, which are full of small Membranes, like those which tie the Lobes together. The Extremities of the Branches of the Wind-Pipe open into the Cavities of the Veficles, which are probably formed by its Membranes; but the Capillary Blood-Veffels are only spread upon the Veficles like a Net, with frequent and large Inosculations.

Of the Vef- Now the Veffels which enter the fels of the Lungs, are the Trachea or Aspera ArLungs. teria, by which we draw in the Air; the Arteria Pulmonalis, which comes from the right Ventricle; and Vena Pulmonalis, whose Trunk opens in the left Auricle of the Heart; each of these divides into two Branches, for the two great Lobes of the Lungs, where they are sub-divided into as ma-

ny Branches as there are little Lobes or-Vefi1

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Veficles in the Lungs. Where-ever there is a Branch of the Trachea, there there is a Branch of the Vein and Artery; and the Trachea is always in the Middle. Upon the Branches of the Trachea Arteria, which are call'd Bronchi, runs a finall Artery, call'd (by Mr. Ruysb) Arteria Bronchiali, a fmall Vein, which Sommichellius calls Vena Pneumonica. The Artery comes from the Aorta, and the Vein opens into the Subclavian. Upon the Bronchi, even to their minutest Ramifications, run likewise the fine Threads of the Eighth Pair of Nerves. Befides thefe, the Lungs have Lymphaticks, which discharge themfelves into the Thoracick Duct; butthey are finaller, and make more frequent Inosculations than I have observ'd any where elfe.

This is the Passage of the Vessels of the This is the Panage of the Venera Trachea through the Lungs; but because the Arteria. Trachea Arteria has a particular Structure, it demands a particular Exami-It is a Canal fituated in the forepart of the Neck, before the Oefophagus; its upper End is call'd Larynx, from thence it descends to the fourth Vertebræ of the Back, where it divides, and enters the Lungs. This Canal is made of Annular Cartilages, which are Of its at small and equal Distances from one Cartilages.

ano-

another. These Cartilages grow smaller and smaller as they approach the Lungs; and those of the Bronchi are so close to one another, that, in Expiration, the fecond enters within the first, and the third within the fecond, and fo the following always enters the prece-Betwixt the Larynx and the Lungs these Cartilages make not compleat Rings; but their hind part, which is contiguous to the Oesophagus, is membranous, that they may the better contract and dilate, and give way to the Aliments as they go down the Oesophagus. But the Cartilages of the Bronchi are compleatly Annular; yet their Capillary Branches have no Cartilages, but, instead of them, fmall Circular Ligaments, which are at pretty large Distances from one another. The Use of the Cartilages is to keep the Passage for the Air always open; but in the Capillary Bronchi they would hinder the fubfiding of the Veficles.

Of its Membranes. These Cartilages are tied together by two Membranes, the one External, and the other Internal. The External is composed of circular Fibres; it covers the whole Trachea externally. The Internal is of an exquisite Sense, it covers the Cartilages internally. It is composed of three distinct Membranes: The first

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is woven of two Orders of Fibres. Those of the first Order are Longitudinal, for the shortening the Trachea; they make the Cartilages approach and enter one another. The other Order is of circular Fibres, for the contracting the Cartilages. When these two Orders of Fibres act, they help, with the External Membrane, in Expiration, in Coughing, and in altering the Note of our Voice. The fecond Membrane is altogether glandulous, and the Excretory Vessels of these Glands open in the Cavity of the Trachea; they separate a Liquor for the moistening the Cavity, and for defending it from the Acrimony of the Air. The third and last is a Net of Veins, Nerves, and Arteries. The Veins are Branches of the Vena Cava; the Nerves of the Recurrent; and the Arteries of the Carotides.

From the Structure of the Lungs thus Of the Use explain'd, the learned Pitcairn has me-of the chanically deduc'd the great Effect they, Lungs. by means of the Air, produce upon the Blood. For whilst the Fatus is in the Womb, the Vesicles of the Lungs lying flat upon one another, compress all the Capillary Blood-Vessels which are spread upon them: But as soon as we are born, the Air, by the Dilatation of the Thorax, is thrust into the Branches

ches of the Trachea Arteria, and blows wi up the Vesicles into Spheres; by which means the Compression being taken of from the Blood-Vellels, and they equal W ly expanded with the Lungs, all the thi Blood has a free Passage through the Bl Pulmonary Artery. But when the Air ral is thrust out again by the Contraction of the Cavity of the Thorax, it being a fluid Body, compresses the Veficles and Blood-Veffels upon them every where equally. By this Compression, the red Globules of the Blood, which, through in their languid Motion in the Veins, were Ar grown too big to circulate in the fine fur Capillary Vellels, are broken and divi-ih ded again in the Serum, and the Blood made fit for Nutrition and Secretion. This Preffure of the Air upon the Blood Veffels, may be demonstrated to be equal to 100 Pound Weight, and in Coughing or Crying it may exceed 400 Pound.

But though these are the necessary Confequences of Respiration, yet several Experiments encline me to think, that fome Particles of the Air must like wife enter the Blood-Veffels, and mix with the Blood in the Lungs. For, first, Tam assured, from repeated Experiments, that Air will escape through the Pores of any Number of Bladders,

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lows when compressed only by the Weight which of the Water into which it is sunk; on off and therefore the Pressure of 100 Pound qual Weight in ordinary Respiration, must the thrust some Particles of it into the the Blood-Vessels. Secondly, The Honoute Air rable Mr. Boyle, in his New Pneumatical Stion Experiments, shows us, That Animals ing a cannot live when shut up in common as and Air, though by a Gage, he has found where it to retain its wonted Pressure, and e red tho' the Receiver has been immers'd ough in Water, cooled with a Solution of Salwert Armoniack. The same Experiments assured to the Control of the Receiver has been immers'd in Water, cooled with a Solution of Salwert Armoniack. The same Experiments assured to the same and the same a fine fure us, That Animals will live longer divi flut up in compressed Air, than in Blood common Air; and that when they are etion dying in the common Air, they may the be reviv'd by prefling in more fresh rated Air. What Mr. Boyle fays, I have , and likewise experienc'd to be true, with this Difference, that as the Animal rceed thut up in uncompressed Air grew effary weak, fo the Mercury in the Barometer feve-(which was used for a Gage) funk, and hink, when the Animal died, it had fallen like-mix For, near one third of an Inch, and therefore it is plain, that the Pressure or Elafficity of the Air was diminish'd by Expe- the Animal; and when the Animal was dead, the Air by degrees recover'd its. ough former Pressure, and raised the Merders, when

cury to the same Height as before, tho' I am fure there was no Communication with the external Air, having tried the Experiment more than once. What other Account can be given of this, but that the Animal did fuck in some of the Elastick Particles of the Air, which when dead were emitted again? All which, I think, do sufficiently prove, that the Air does mix with the Blood in the Lungs. Laftly, It may be demonstrated, That the dif-ference between the Gravity of the Air in the City, and that of the Country, (which can be but very small, upon the Account of the Effuvia, as the Barometer shews it to be) can never be the Cause of that Difficulty of Breathing which some have in the one, and not in the other; for they are not near so senfible of the different Gravities of the Air in the same place, as they are of a much smaller difference in two distinct and remote Places, where the Contents of the Air are different.

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Of the Larynx.

THE upper End of the Trachea Ar-Its Signateria is called the Larynx. It liestion. below the Root of the Tongue, before the Pharynx. It is composed of five Cartilages, which fometimes, in Old Men, become as hard as Bones.

The First is the Ovegend'is, or Scuti-Of the Carformis, because of its Figure. It makes tilago that Protuberance in the Forepart of Scutiforthe Larynx called Pomum Adami. It mis. is a thin Cartilage, about an Inch broad, but not so long. It's Cancave within, and Convex without. Its four Angles have each a small Production; the two upper, which are longer, are tied to the Horns of the Os Hyordes, and the two lower to the second Cartilage, which is called Keinoud'is, or Annularis, Of the Anbecause it resembles a Ring. It's very nularis. large and thick behind, which part is ike the Stone of a Ring, and it grows narrower to its Forepart; it's fituated below the other Cartilages, of the Laynx, they stand upon it as upon a Basis, and by it they are fied to the Trachea. CT.

The Third and Fourth are alike, and Of the Ahave one common Name, which is rytenoithe des.

the Acutawoed is. They reach from the said Middle of the Concave fide of the Thy-wa rordes to the upper and back part of the Annularis, and they make that Chink or Au Rimula, which is the Mouth of the La-rynx, call'd Glorris. Betwixt those and he the Sides of the Thyrordes, there are two small Cavities on each Side, form'd join them together; in which if a lit tle Drink or Bread fall, as fometime rn happens when one laughs or fpeaks it all Eating or Drinking, it causes a violent of Cough, and a great Tickling.

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The fifth and last Cartilage is the des piglottis. Epiglottis; it's of a fofter Substance bw than the others; it resembles a little orn Tongue; it is tied by its Bafis to the upper and middle part of the concavene Side of the Thyroldes: It's Ufe is to co ore ver the Glottis in Eating and Drinking uni for the Aliments, by their Weight ert press it close down upon the Glorid age and they pass over, without entring the Larynx, into the Oesophagus: Bu when the Aliments are pail, the Epart glottis, by its natural Refort, which is in common to all Cartilages, lifts unter again, and gives way to the Air iles. Breathing. When we speak or laugh T the Glottis must necessarily be operofit for the Passage of the Air; therefore if the the s not convenient to speak while we Thy-wallow.

The Larynx has two Pair of Common Of the the The Larynx has two Pair or Common Muscles of Auscles, and five Pair Proper. Muscles is the Larynx

La The First of the Common Muscles is the Laand he Sternothyroides; it arises from the up rynx.

are per part of the infide of the Sternum, Sterno-rm'd and afcending on the fides of the Trahich bea Arteria, it is inserted to the lower a literart of the Sides of the Cartilago Scuti-

imes rmis: When these Muscles act, they
ks is all this Cartilage downwards.
olen The Second is the Hyothyroides; it a-Hyothyfes from the lower part of the Os Hy-roides. the des, and descending, is inserted into the stand ower part of the Scuiformis, near the little ormer: They pull up the Larynx.

The First of the proper Muscles is Cricothy.

encare ne Cricothyroides; it ariseth from the roides.

king unning under the Thyroides, it is in-

Gloringe.

entring. The Second is the Crico-Arytanoides Crico-Ane Em art of the Cricoides, and ascending, des. hich is inserted to the lateral part of the Aifts w stanoides; this dilates the Arytanoi-

Air is es. The Third is the Crico Arytanoïdes Crico-Ae ope offices; it arises from the back part rytenoirefore f the Cartilage Cricordes, and is in-des.

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form er.

Thyro-Arytænoides. The Fourth is the Thyro-Arytanoïdes it ariseth from the Internal and Concave side of the Scutiformis, and is in serted into the foreparts of the Arytanoïdes, it contracts the Rimula.

Arytznoides.

The Fifth Muscle is the Arytenordes it runneth upon the upper part of the Cartilage Arytenordes, and, with its Fellow, forms a Sphineter for contracting of the Rimula.

A true Squinzie, which is caused be the Inflamation of these Muscles, generally mortal; because they she exactly the Chink of the Larynx; there fore Bronchotomy is absolutely necessaring this Case, but it is rarely, though may be safely used.

Of the Vef- The Larynx receives Veins from the Carotide

Larynx. and Nerves from the Recurrent.

Of the Glandulæ Thyroïdes.

On the lower part of the Laryn upon the fides of the Annulary Carl lage, and of the first Ring of the Trachea, there are two Lymphatick Gland call'd Thyroidea: of the Figure of Pear, their Colour is red; they have Veins, Nerves, and Arteries, as the Larynx.

The Use of the Larynx is not on to form the Voice, but also, by the

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r the different Apertures of its Rimula, the Lungs are more or less compressed by the Air; for if the Aperture of the Laynx had been as wide as the Afpera Arteria, the Lungs could have suffer'd

ittle or no Compression.

Had it not been for the Larynx, we ould have received no Benefit by breahing : for if the Mouth of the Albera Arteria had been large and wide, the Air had not refifted that Force by which t is thrust out in Expiration, so as to nake any Compression upon the Lungs, vhereby the Globules of the Blood ould have been dissolved, or the Paricles of both Fluids mixt together, which we find so necessary to Life, that ve die without it. Nor does the Laynx only preserve Life, but it likewise onduces to render it happy and areeable, by forming the Voice, which s the Sound of the Air, drove through he narrow Chink of the Glottis, with Velocity greater than in an ordinary Expiration. This Sound is encreased y the Cavities of the Mouth and Nose, which refound like the Hollow of a Violin, as is evident by the trembling o be felt in the Nose while we speak. And these Cavities not only encrease, but also conduce to the Agreeableness of the Voice; for how disagreeable is

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the Alteration of the Voice, which fol lows a Lofs or Stoppage of the Nofe And the Dimensions of the Mouth a always proportion'd to the Notes for med in the Glottis, low Notes being co stantly accompany'd with a Prolongar on, and high Notes a Contraction of i Cavity. The Notes themselves are for med by the different Apertures of the Glottis: For when the Glottis is contra ted, the Air being drove with an equ Force, must move more iwiftly; an the Sides of the Glottis being more ten their Vibrations must be quicker a shorter, and consequently the No high. The contrary happens when the Glottis wideneth.

Each Note is capable of all degre of Strength, for the Strength of t Voice is always proportionable to t Quantity of Air thrown out of the I rynx, in founding of the fame No Now if the Strength of the Note is be encreased, the Diaphragma, but mo especially the Muscular Fibres of the Trachea Arteria, contract more firon ly, and thrust out a greater Quantil of the Air, and the Aperture of the Glottis encreases porportionably, th this greater Quantity of Air may pa through with the same Velocity as be fore, that the fame Note may be cont No mued.

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Now supposing the greatest Distance f the two Sides of the Gloris to be one enth part of an Inch in founding of 12 Notes (to which the Voice eafily reachs) this Line must be divided into 12 arts, each of which gives the Aperure requisite for such a Note, with a ertain Strength. But if we confider he Subdivision of Notes into which the loice can run, the Motion of the Sides f the Glottis is still wastly nicer; for if f two Chords founding exactly Unions, one be shortned part of its ength, a just Ear will perceive the lifagreement, and a good Voice will ound the Difference, which is the part f a Note. But because this is a great licety, I shall only suppose that the oice can divide a Note into a 100 Parts, om whence it follows, that the diffeent Apertures of the Glottis actually diide the tenth part of an Inch into 1200 arts, the Effect of each of which prouces a sensible Alteration upon a good ar. But because each fide of the Glors moves just equally, therefore the divisions are just double, or the Sides f the Gloreis, by their Motion, do actully divide one tenth part of an Inch in-0 2400 Parts. ay pa as be the Italic upon is a color

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### CHAP: IV.

Of the Upper Cavity, or Head.

# SECT. I.

Of the Frontal and Occipital Muscles; and of the Pericranium.

HE Head is fituated in the up per part of the Body, not only for the Conveniency of the Senses, but also that the Brain may the more eafily fend the Animal Spirits to all the Parts of the Body.

Its Natural Figure is round, but little flat upon its Sides; round, tha it might contain the greater quantity of Brains; and flat upon its Sides, that the bounds of the Sight may be the larger or rather that the Ears might not be to

much expos'd to danger.

We have divided the External Part of the Head into two, the Face and the hairy Scalp; we shall now divide i into the Containing and the Contains The Containing Parts are the um, Skin with the Hair upon it, the Perioce cranium, the Skull, and the two Me

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inges. 1 Of the Skin and Hair we have ready spoken; of the Skull we shall peak in its proper Place.

Anatonifts do generally fay, That e Skull is cover'd both with a Perianium and a Periosteum; but they have ken the Aponeurofis of the Occital and Frontal Muscles for one of em. These Muscles lie immediately ider the Skin. The first two are cald Françales. Their fleshy Fibres are ferred into the Eye-brows; from ence they go straight up the Os Fronand are continued by a long and ge Aponeurofis to that of the Occipita-; they adhere closely to the Skin of e Forehead, which they pull upwards. he other two Muscles, which are calbut Ind Occipitales, have their fleshy Fibres the sed to the Skip of the Hind-head, tity which they also pull upwards: They at the p short, broad, and thin, and they d in a large Aponeurofis, which joins be to at of the Frontals, and both together ver the whole Skull.

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minges.

Therefore the Periofteun or Periora-Of the Pend the em is a very thin and nervous Mem-ricranium vide i ane, of an exquisite Sense, which ntains vers immediately not only the Crae the um, but all the Bones of the Body, e Per cept the Teeth. It is tied to the Du-

through

170 Of the Dura and Pia Mater:

through the Sutures of the Skull. It receives Veins from the External Tugulars, Arteries from the Carotides, Nerves from the fifth Pair of the Brain, and from the fecond of the Neck. verbut seiden

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#### SECT. H. of the Area and Chambrie

Of the Dura and Pia Mater.

THE Membranes or Meninges, which are within the Cranium, are two the Dura Mater, and the Pia Mater , fo call'd, because they are supposed to be the Origination of all the Membranes of the Body.

Of the Du-

The Dura Mater is a strong and ra Mater, thick Membrane which covers all the Cavity of the Cranium; it contains the whole Brain somewhat loosely, that the Veffels which run between its Duplicature, and upon the Surface of the Brain, be not too much pressed by the Cranium; it flicks very close to the Bafis of the Cranium, and to its Sutures, by the Fibres and Vessels it sends to the Pericranium; it is fastened to the Pia Mater, and to the Brain, by the Vessels which pass from the one to the other. It gives a Coat or Covering to Prot all the Nerves which rife from the Dul Brain to the Spinalis Medulla, and to

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all the Nerves which rife from it. Its Surface is rough towards the Cranium, but smooth towards the Brain. It is a double Membrane woven of strong Fibres, which may be plainly feen on its infide, but very hardly on its outfide pext the Cranium.

The Dura Mater hath three Proces- Of its Profes made by the doubling of its inner ceffes. Membrane. The first rifes by a narrow beginning from the Crista Galli, to which it is fastened, and as it approa. thes the hind-part of the Head, it grows proader and broader, till it terminates ranes where the Longitudinal Sinus ends. It divides the Cerebrum into two Hemi-pheres near as deep as the Corpus Cal-1 the ofum. It resembles a Sickle, therefore s the t is called Falx. The fecond separates he Cerebrum from the Cerebellum down to the Medulla Oblongata, that the f the Weight of the Cerebrum may not offend y the he Cerebellum which lies under it; this ne Ba- Process is very strong and thick, and in tures, avenous Beasts 'tis for the most part ds to pony, because of the violent Motion of the their Brain. The third is the smallest; by the t separates the External Substance of the he hinder part of the Cerebellum into two ing to Protuberances: and upon it Monsieur m the Du Verney's fifth Sinus runs.

In

Of the Dura and Pia Mater.

172 Of the Sinus's of the Dura Mater.

In the Dura Mater there are several Sinus's or Channels, which run between its External and Internal Membrane; of these there are four principal ones which are commonly described.

First, Of lis.

The First is the Sinus Longitudinalis, the Lon- it rifes from the blind Hole in the upper gitudina- part of the Crifia Galli; it runs along the upper part of the Falx, and ends where it ends; it lies exactly under the Sutura Sagitalis. Into this Sinus the Veins of the Brain, and some of the proper Veins of the Dara Mater, bring back the Blood which they receive from the Arteries. Of these Veins, some running obliquely from the fore-part of the Brain backwards, and others contrary, from the hind-part forward creep a little space between the Duplicature of the Membrane, as the U reters do upon the Bladder, and so they open in the Sinus. In this Sinus there are feveral small Cells and round Ligaments, which go from one fide of the Cavity to the other. These, by their Elasticity, further the Motion of the Blood.

The Second and Third Sinus's, which this Sinus pours into, are the Laterales; they rife from the End of the first, in to which they open, and going down

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Of the Dura and Pia Mater. upon the Sides of the Occipital Bone, in a crooked way, they pass through the same Hole with the Eighth Pair of Nerves, and discharge them into the internal Jugulars. Into these Sinus's some Veins and the other Sinus's dif-

charge themselves.

The Fourth Sinus runs by the broad Of the Extremity of the Falx, and opens where Fourth the Lateral Sinus's join the Longitudinal. Sinus This meeting of the four Sinus's is called Torcular. It receives the Blood at its other Extremity from the Plexus Choroi-

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Befides thefe, there are fix more, Of the Siwhich have been defcrib'd by feveral nus Supe-Anatomists. The first two are call'd riores. Superiores; they rife from the hinder Proceffes of the Sella Turcica, or from the Circular Sinus's of Dr. Ridley, and tun a long the upper part of the Internal Processes of the Os Perrofum; then defeending, they open into the Laterales;

There are two more called Inferiores; Of the Inthey rife from the same Place with the feriores. other two, and running upon the Union of the Os Petrosum with the Occipital, they open into the Laterales, just as they are going out of the Skull.

There is a Fifth, which the curious A Fifth Mr. Du Verney demonstrates ; it runs Sinus. upon the third Process of the Dura Ma-

ter,

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f the which erales; ft, in down upon ter, and divides into two Branches, of which one opens into the Laterales, and the other into the Sinus Vertebrales. That exact Anatomist Dr. Ridley, in his

Of the Cir-Treatise of the Brain, gives account of a cular Si- Sixth, which he calls the Circular Sinus, nus. because it surrounds the Glandula Pituitaria; is communicates with the two Supe-

riores and Inferiores.

Of three other Si-

Vefalius hath remark'd a Sinus which runs along the Bottom of the Falix, and which opens into the fourth Sinus; this is call'd by Mr. Du Verney, Longitudinalis inferior. There are two more fituated at the second Process of the Dura Mater, one on each fide; they are about at Inch wide from the Laterales, into which they open; but these three do not always appear.

The Use of The Use of these Sinus's is to receive the Sinus's, the Blood of the adjacent Parts from the Veins, to which they are as so many Trunks which discharge the Blood into

the Internal Jugulars.

Of the Vef- The Veffels of the Dura Mater are fel of the first, a Branch from the Carotidal, Dura Ma-whilst it is in its long Canal, which is ter. dispersed in the fore and lower part of the Dura Mater. Secondly, An Artery which enters the Hole of the Cranium, call'd Foramen Arteria Dura Mater; it is dispersed on the sides of this

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Membrane, and runs as high as the Sinus Longitudinalis. The Vein which accompanies the Branches of this Artery goes out of the Skull by the Foramen Lacerum. Thirdly, a Branch of the Vertebral Artery and Vein, which last passes thre' the Hole behind the Occipital Apophyfis, they are dispersed in the hind part of the Dura Mater.

The Blood which is brought by the Arteries, is carried back by the Veins which go out at the same Holes by which the Arteries enter: But in cafe the Swelling of the Arteries, by a Preternatural Fermentation of the Blood should compress the Veins as they go out of the Skull; which might eafily happen, being it has more Arteries than Veins; therefore there are several other Veins, which inosculate with the Arteries, and which carry the Blood from them into two small Veins, which are on the fides of the Longitudinal Sinus's; 'tis these Veins which open into this Sinus, that the Blood which was flopt the other way, may have a free Circulation this way, as has been ingeniously observ'd by Dr. Ridley.

It hath also Nerves from the first Branch of the fifth Pair, which give it an exquisite Sense. It has a Motion of Systole and Diastole, which is caused by Skall

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the Arteries which enter the Skull. No doubt the great Number of Arteries in the Brain, contribute more to it, that those few proper to it felf, which may affift a lirtle, though not very fenfibly because of their Smallness and Paucity The Use of the Dura Mater, is to conthin and cover the Brain, the Spina Marrow, and all the Nerves, to divide the Cerebium in two, and to hinder it from preffing the Cerebellum. 4 85 12

Of the

The Pia Mater is a thin and delicate Pia Mater double Membrane which lies under the Dura Mater and Covers ammediately the Subdance of the Brain. Its inne Membrane is much larger than he out all the Foldings and Circumvelutions of the Brain, to feparate them, and to faftain the Blood Veffels, Which fiake Gereral Turnings and Windings upon it, before they terminate in the Substance of the Brain. It has the fame Ule as the Dura Mater, and V alant aid Share, chut the blood which was flopt

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Of the Cerebrum and Cerebellum It had nice shower than the

The Brain THE whole Substance of the Brain is divided in- divided into two Parts; that which hies mostly on the fore parenof othe to two. the Skull

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Skull is properly called the Cerebrum; and that which lies in the back-part, under the hind-part of the Cerebrum, (which is supported by the second Procels of the Dura Mater) is call'd the Cerebellum. Both the one and the other are contained in the Meninges and in the Cranium, as in a Case of Bones, that nothing may hurt their Substance, which is foft.

The Cerebrum is of a round Figure; it Of the Fiis divided by the first Process of the gure and Dura Mater into the right and left Substance fide. Its External Surface resembles of the Cethe Turnings and Windings of the In-rebrum. testines. In the Corebrum we diffinguish two different Substances, the external, which is of an Ashy Colour; and the Internal, which is of a white, Colour. Its External Subflance is called Substantia Corticalis, for Cineracea; it is foft, glandulous, and of the Colour of Ashes. Its Internal, call'd Substantia Medullaris, is firmer, white, and fibrous; of it the Nerves are made, and it reaches to the Extremity of the Medulla Spinalis, where it divides into Fi-

The External Substance of the Brain, by its Circumvolutions, refembles the Small Guts; and in the middle of each Circumvolution is the beginning of the Me-4.15

Medullary Substance: So that the Cortical Subflance is always on the External fide: And the inner Lamina of the Pia Mater is co-extended with the Cortical Substance, which it immedi-

ately covers every where.

Malpighius, who has examin'd this Cortical Substance, fays, that it is nothing but a heap of little Oval Glands, which receive the Capillary Branches of the Veins and Arteries which belong to the Brain, and which fend out an infinite Number of Fibres, which altogether make up the Medullary Substance, which going out of the Cranium, forms the Nerves and Medalla Spinalis contained in the Vertebra.

Structure the Brain.

A general The Internal Substance of the right Idea of the and left fide of the Brain coming to join one another, leave a Space be-tween them, which forms the three Ventricles, or Centrum Ovale; the upper part or covering of this space, is call'd the Corpus Callofum, the Bottom of this Space is the Internal Substance of the two fides of the Cerebrum, gathered together, as it were, in two Bundles, which are called Cura Medulla Oblongata, upon them are the Protu-Berances call'd the Corpora Striata, and the Thalami Nervorum Opticorum. These Crara uniting make one Body, call'd the

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the Medulla Oblongate, upon which there are four Prominences call'd Notes and Testes: And behind these Prominences, the Internal or Medullary Substance of the Cerebellum being also divided into two Bundles, forms upon each fide of the Medulla Oblongata three more Protuberances, and then it passes out of the Cranium into the Vertebra, where it gets the Name of Medulla Spinalis. This is a general Idea of the Structure of the Brain, for the better understanding its Parts: Which we shall now deferibe in particular.

Below the Depth of all the Circumvolutions of the Brain, the first thing that appears immediately under the first Process of the Dura Mater is the Corpus Callefum, or the Covering of the two Lateral Ventricles, formed by the Union of the Medullary Fibres of each fide of a man de

This being laid afide, the two Late-Of the two ral Ventricles appear; they reach from Ventricles the forepart of the Cerebrum backwards; they are pretty broad in their hindpart, but they grow narrower towards their forepart. They are divided into the right and left Ventricle by a thin transparent Membrane, which comes from the under fide of the Corpus Callosum, and is extended to the Fornix, which

Of the Septum Medium. which is in the bottom of the Ventrieles pithis Membrane is call'a Seprim Lucidum of am apt to think it is a Production of the Pia Mater, which covers all the fides of the Ventricles.

In these two Ventricles there are four Prominences, two in each Ventricle.

Of the Corpora Striata.

The foremost two are call'd Corpora Striata, which are the Tips of the Crura Medulla Oblongata. They are oblong, and their Extremities come down upon the fides of the two other Prominences; they are of a Cineritious Colour without, but in their internal Substance there are many white Streaks, which are the Medullary Subflance mixed with the cineritious for glandulous. They are, as it were, tied together by a Medullary Process, call'd (by Vicuffins) Commiffica Craftoris Nervi Amu-

Of the Thal. Nerv. Opt.

The two other Prominences are called Thalami Nervorum Opticorum, because the Optick Nerves rise out of them; they are Medullary without, but a little cineritious within; they are of an oblong Figure; they are upon the upper part of the Crura Medulle Oblongate : Between them there is a Medullary Tract, which encompasses them, call'd (by Willis) Limbi Posteriores Corporum Striatorum. Upon them

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also lies the Plexus Choroides, made of Of the Veins, Arteries, and little Glands. Plexus Dr. Ridley says, he has seen Lympha Choroiticks rise from it. This Plexus reaches destrom one lateral Ventricle to the other, passing under the Fornix, above the third Ventricle. It sends a Branch to the fourth Sinus of the Dura Mater.

In the middle, above the Corpora Stri-Of the ata and the Thal. Nerv. Opr. there lies Fornix. a thin and broad Production of the Medullary Substance, which comes from the fore-part of the Ventricles by two Roots, and reaches to the hinder part, where it ends by two other Protuberances call'd its Crura, which cover a great part of the Thal. Nerv. Optic. This Production is call'd the Fornix, because it is a covering to the third Ventricle.

Under the Fornix there is a Rima be-Of the tween the Crura Medullæ Oblongatæ, third Ven-which is the third Ventricle, it being a tricle. little dilated in its fore-part: There is a Hole that goes down to the Glandula Piruitaria; this Hole is the Entry to the Infundibulum or Funnel, so called because of its Figure. It is a small Con-Of the Induit made of the Medullary Substance, fundibucovered with the Pia Mater; it pierces lum. the Dura Mater upon the Basis of the Skull, and sinks into the Substance of The

The Glandula Pituitaria, which is Glandula fituated in the Sella Turcica, closely cover'd with the Pia and Dura Mater; Pituita+ ria. it is of a harder Substance than the other Glands of the Body; it receives the End of the Infundibulum, which carries a Liquor from the Ventricles

te Mirabile.

Of the Re- by the Rete Mirabile, or a Plexus of some Branches of the Carotidal and Carvical Arteries, which break the Imperus of the Blood, and abate the Velocity; as it paffes through the tender Substance of the Brain.

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into this Gland, which is furrounded

nus.

Of the A- But to return to the third Ventricle In its hinder part there is another small Hole called Anus, which leads into the fourth Ventricle in the Cerebellum In the upper part of this Hole is fitua ted the Glandula Pinealis, (Des Cartes)

Pinealis.

pretended Seat of the Soul) about the Bigness of a Pea; it is composed of the same Substance with the rest of the Brain, and for the fame Ufe. It is tied by fome Fibres to the

Nates.

Nates, which are two Prominences of the Medulla Oblongata, fituated a bove the fore-part of that Conduit which leads from the Anus to the fourth Ventricle; they are of an Oval Figure pretty big, and immediately behind 'en are two other Prominences of the fame FiFigure and Substance call'd Testes, both Testes cover'd with a Net of Blood-Vessels.

There is a small transverse Medullary Protuberance behind the Testes, from which the Pathetick Nerves rise.

The Conduit which reaches from the Ishmus, Anus to the fourth Venericle, is in that part of the Medulla Oblongata, which s betwixt the Cerebrum and the Cerebellum, call'd the Isthmus. The upper Part or Cover of this Conduit, which s betwixt the Teffes and the foremost Vermicular Process of the Cerebellum fourth to which two it is tied at its two Ends. and to the Processes that come from the Cerebellum to the Testes, at its fides, is call'd Valvula Major: 'Tis of a Medul-Valvula ary Substance; its Use is to keep the Major. Lympha from falling out above the Nerves in the Basis of the Skull. These are all the Parts belonging to the Cerebrum in the second water research the fire physical

Now the Cerebellum, which is much Cerebellefs, is also composed of a Cortical and lum.
Medullary Substance; its Superficies
makes not Turnings and Windings as
that of the Cerebrum; but its Foldings
are straight, and they resemble the
Segments of Circles, or the Edges of
Plates laid in one another; and these
Segments are largest in its middle, and
they grow less as they approach its
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Of the Gerebrum, &c.

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Processos fore and hind part, where they feem to Vermirefemble two Worms, therefore call'd formes. Proceffus Vermiformes:

The Medullary Substance of the Co rebellum, as it approaches the Medulla Oblongata, gathers together, and the divides equally into two Bundles, which are joined to the two Sides of the Medul la Oblongata: As they separate, they leave a little space upon the upper fid of the Medulla, which is call'd the fourt Ventricle; and its further End, because of its Resemblance, Calamus Scripu

Of the fourthVentricle.

rius. The Top of this Ventricle is cove red with feveral Blood-Veffels wove like a Net. The Medullary Subflance of the G

Of the bellum.

Processes of rebellum makes three Processes upon each the Cere- fide of the Medulla Oblongata. The fir two go on each fide of it to the Testes the Valvula Major is betwixt then The fecond two are pretty broad they go ftraight down on each fide, and meet on the under fide of the Medulla they make that Protuberance call'd Pri Processus ceffus Annularis; and the third goes back

Annularis wards upon the upper fides of the M dulla; they make it look bigger, be ing like two Cords upon its fides.

This is all that is remarkable in the Cerebrum , Cerebellum , and upper fid of the Medulla Oblongara. But if you

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em to turn over the Brain, you may fee diflinctly the Rife of all the Nerves, the call Infundibulum, two white Spots behind 學被 he C it, the Crura Medulle Oblongate, one on 1edulla the which Medul the er fid fourt ecaul Scripto COVE wove

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if you tun each fide of the Cerebrum. Where they oin, you may fee the Processis Annulais, or Pons Varolii: And beyond that, here are two Prominences call'd Corpo-Corpora a Pyramidalia; they are about an Inch Pyramiong ; and on each fide of them, to- dalia and Olivaria. vards their lower End, there are two nore, which, because of their Figure, re call'd Corpora Olivaria; and then the Medulla Oblongara goes out of the Skull, seing contained in the Ria and Dura which is behind the Teffer and the

Observe. That the Medulla Oblongawith all the Protuberances which re upon its upper and lower fides, are or purely of the Medullary Substance, at linternally they fare mixid with he Cortical; and it is this Mixture which makes those Smie, to which hey have given different imaginary Mes, according to their different Polifor from the fider of the Pronffusnoi

Now the Veffels of the Brain are Veryes, Veins and Arteries The Nerves are Ten Pair. The First Pair re the Olfactory Nerves they rife rom the Bafts of the Corpora Striata nd pale through the Holes of the Or

Cribriforme. The Second Pair are the Optick Nerves; they rife partly from the Extremities of the Corpora Striate and partly from the Thalami Nervorm Opticorum, which they almost embrace they unite together above the Cella Tu cica, and simmediately dividing again they pals through the two foremo Holes in the Os Sphenoides : Th Third Pair are the Movers of the Eyes they rife on each fide of the Infundible lum from the Medulla Oblongata, an go out at the Foramina Lacera. The Fourth Pair are the Pathetick Nerves they rife from the small Medallary Con which is behind the Teffes, and pa through the Foramina Lacera. (Th Fifth Pair rife from the fore-part of the Processus Annularis; they give Nerve to the Dura Mater ; each of them d vides into three Branches, the first pa fes out at the Foramen Lacerum, the fe cond at the third Hole of the Os Sphane des, and the third through another Hol of the fame Bone. The Sixth Pair fes from the fides of the Proceffus As nularis; and goes out at the Foram Lacerum; but just before it goes out it casts back a Branch, which make the Root of the Intercostal Nerve; this goes out at the Canal through which the Carotidal Artery enters, The Sevent

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s the Auditory Nerve; it rifes from he hind part of the Processus Annularis, nd enters the Hole in the Process of he Os Petrofum. The Eighth Pair is he Par Vagum; it rifes from the Meulla Oblongata behind the Processus innularis, by feveral Threads which in in one, and it goes out at the same Hole the Lateral Sinus's open into the ugulares. The Ninth Pair rifes from he Processus Olivares of the Medulla blongata, and paffes out at a Hole in he Occipital Bone, which is proper to felf. The Tenth and last Pair rifes y several Fibres from the beginning of he Medulla Spinalis; from thence afending within the Occiput, it turns, nd passes out at the same Hole thro' which the Vertebral Artery enters, beween the first Vertebre and the Occiital Bone, running through a Sinus in his Vertebra. Thele are the Nerves of he Brain, which we shall trace further n the Eighth Chapter.

The Arteries are the two Internal Of the Vel-Carotidals which pass through two fels of the Oblique Canals in the Offa Perrofa: Brain. As foon as they enter the Skull, they make give a Branch, which enters the Orbit

the Eye; they give Branches which make the Rese Mirabile, then they beyond pierce the Dura Mater on each fide

of the Infundibulum; they communicate with the Cervical Artery, and they give Branches to the Plexus Choroides, and an distributed through all the Substance of the Brain: Their Branches make many Turnings and Windings upon the Piu Mater, and at last are lost in the little Glands of the Cortical Substance of the Brain.

The two Vertebral Arteries which come out of the Holes in the transver Processes of the Vertebra, enter the larg Hole of the Occipital Bone; the pierce the Dura Mater, and go alon the under Side of the Medulla Obling ta then they call back two Branch for the Spinal Arteries, and at the Pr ceffus Annularis they join in one Branc call'd the Cervical Artery. This con municates with the two Carotides, two Branches call'd the Communica Branches; then it divides again in two, which give Branches to the Re Mirabile, Plexus Choroides, and they at -6 V ell C afterwards distributed through all th Substance of the Brain, ending the Cineritious Substance, as the Con ridales. 10 18 gat 120 19 1 1 1 1600 1

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The Veins enter not the Cranin at the fame Holes that the Arteris do, because, as Doctor Ridley right by observes, upon any Fermentation

of the Blood, the Swelling and Pulse f the Arteries would compress the Teins against the bony Sides of their affage, and so cause a Stagnation and xtravasation of the Blood in the rain, which would be the Destructi-n of the whole Machine. Neither o the Veins rung along by the Sides the Arteries in the Brain, as they do brough all the rest of the Body, but ey rife from the Extremities of the rteries, in the Cineritious Substance the Brain, and go straight to difrge themselves into the Sinus's of the ura Mater.

The Blood which is brought into The Use e Brain by the Carotidal and Ver-of the bral Arteries, is separated by the Brain. lands which make the Cineritious nd Cortical Substance of the Brain, om its finest and most subtil Parts, Il'd Animal Spirits, which are reeived from the Glands by the Fibres f the Medullary Substance, which the beginning of the Nerves. Each lerve therefore is a Bundle of ery fine and fmall Tubes, of which ome are no bigger than the Hunredth part of an Hair; and these lubes are the Excretory Ducts of the y right Cineritious or Glandulous part of the entation Brain. This does not only appear from

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from the Structure of the Brain, but by Reason likewise we are assured, that there is fuch a Fluid as we call Animal Spirits running in the Nerves. For feeing all Sensation is performed by the Nerves, ir must be done either by the Substance of the Nerve, or the Fluid which is contained in the Nerve: If by the Substance of the Nerve, it must be by a Vibration from the Part upon which the Impression is made to the Brain. Now that there can be no Vibration from the Impression of External Objects upon Animal Nerves, which are flack, and furrounded all along by other Bodies, is evident; and therefore Sensation must be performed by the Fluid in the Nerves.

The Motion of this Fluid is not fwift and rapid, as is generally supposed, but slow and languid, seeing all its Motion proceeds from the Dilatation of the Arteries compressing the soft Substance of the Nerves, and from the Force by which it is thrust through the Glands of the Brain. And when the Nerves are full of this sine Fluid, the Impressions of Objects may be communicated to the Brain without any quick Motion in the Animal Spirits, either by retard-

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ing, or stopping their progressive Motion, or by causing an Undulation. If to these we add, That the Animal Spirits must be confined within their own proper Chanels, as well as the other Fluids of the Body; we shall easily perceive how precarious the many ingenious Hypotheses are, which the Learned Willis has elegantly described in his System of the Nerves, and Nervons Distempers.

# SECT. IV.

Of the Eyes.

THE Organs of Sight are divided into two Parts: The Internal Part, which is the Globe or Body of the Eye; and the External Part, which is those Parts about the Globe subservient to it.

The first of these last are the Eye-Of the brows, which are nothing but some Eye-brows. Hairs bunching out above the Eye, by some Fat which is under the Skin in this place. They break the Rays of Light, that they be not directly darted into the Eyes, which would greatly offend the Sight, as they do when we look directly upon the Sun.

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The Eye-

The next are the Eye-lide, two to each Eye. The uppper Lid moves very quickly, the under very undiffernibly.

Its Mus-

The upper Eye-lid is lifted up by the Musculus Redus, which rifes from the bottom of the Orbit of the Eye, where the Optick Nerves pierce the Cranium, and passing above the Musculus Superbus, 'tis inserted by a large Tendon to the

Border of the Eye-lid.

Both Lids are brought together to shut upon the Eye by another Muscle called Orbicularis. It rises from the great Angle of the Eye, and its Fibres are spread two Fingers Breadth, covering the Under-Lid, they reach to the Little Canthus, from which continuing its Circular Fibres which cover the Upper-Lid, it is inserted into the same Place from which it arose. Some Authors divide this Muscle into two, the Superior and Inserior, which they make to rise from the great Canthus, and to be inserted into the little Canthus.

Of the Conjunctiva. The Eye-lids are covered within with a smooth Membrane called Conjunctiva; because it is continued upon the forepart of the Globe, constituting that which we call the White of the Eye; it joins the Globe to the Edges of the Orbit.

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The edges of the Eye-lids have two Of the Cimall and foft Cartilages, like the Seg- ha. ments of a Circle, called Cilia; they keep the Eye-lids extended, that every Part may be equally raised. Upon them here is a Rank of small Glands, whose Excretory Channels open upon the Edges f the Lids. They yield a Wax which afteneth the Eye-lids together whilst ve fleep. They are covered with the kin externally, and with the Conjunctia internally. Upon the Edges of the Lids here are also some Hairs in form of a allisado, to preserve the Eyes, as the ye-brows do, and to hinder any Filth r Flies from falling into the Eyes.

On the back-side of the Conjuntiva, Of the pon the upper part of the Globe, is Glandula he Glandula Lachrymalis, pretty large, Lachryivided into several Lobes, each of which malis.

ends out an Excretory Channel which pens in the forefide of this Membrane, there it covers the upper Lid. This cland separates the Matter of the Tears, thich, by the continual motion of this id, moisten the Cornea, which otherwise would dry and wrinkle by the connual Action of the external Air.

The edges of the Eye lids being of an qual Convexity with the Ball of the ye, which they touch, as the Tears ill from off the Cornea, they are stopt

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Puncta Lachry-

by the edge of the under Eve-lid, along which they run, till they fall into two fmall Holes in the great Canthus of the Eye, one in each Eye-lid. These Holes are call'd Punsta Lachrymalia. They lead to a small membranous Bag, which is fituated in this corner, upon the Os Lachrymale; from the bottom of which there goes a small Pipe, which pierces this Bone into the Nole, and opens under the upper Lamina of the Os Spongio It moistens the inner Membrane of the Nostrils, by the Humour of the Lachrymal Gland, which runs from of the Globe into them. Sometimes the Acrimony of this Humour caufeth Snee zing, which we hinder, by preffing the Angle of the Eye, and fo flop its run ning.

Between these two Punita, there is a Caruncle which serves to keep them open when the Eyesare shut: This Carunck was thought to be the Glandula Lacky

malis.

Of the The Globe of the Eye is moved by Muscles of four straight Muscles, and two obliques the Eye. and betwixt them there is a great deal of Fat, which facilitates the Motion of the Globe.

The first of the four straight Muscle is called Attollens, or Superbus; it lie upon the upper part of the Globe;

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pulleth up the Eye when we look up. The second is call'd Deprimens, or Humilis; it pulleth down the Eye. The third is call'd Addustor; it draweth the Eye towards the Nose. The fourth Abdustor; it draweth the Eye toward the little Canthus. They rife all four from the Circumference of the Hole in the Orbitsthrough which the Optick Nerves pass, and they terminate about the Cornea by four thin and broad Tendons. When they all act together, they draw the Eve towards the bottom of the Orbit. When the Superbus and the Adductor, or the Abduttor, act together, or the Humilis and the Adductor or Abductor act together, they perform the Olique Motions, which have been attributed to the oblique Muscles.

The first of the Oblique Muscles, which is the fifth of the Eye, is the Obliquus Minor; it rises from the lower side of the Orbit near its External Circumference, where the first and second Bones of the upper Jaw join together, and ascending obliquely by the outer Corner of the Eye, 'tis inserted to the upper and external Side of the Globe behind the Tendon of the Abdustor.

The second of the Oblique Muscles, and the fixth of the Eye, is the Obliques Major; it rises from the bottom of the

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Orbit, and marching obliquely towards the great Canthus, in the upper part of which, near the Brink, there is a Cartilaginous Ring, through which it passes its round Tendon; from whence reverting backwards, it is inserted into the upper part of the Globe, behind the Tendon of the Attollers.

The Use of the first of these Muscles is to draw the Globe of the Eye forwards, and to turn its Pupil upwards; and of the second, to draw it forwards, and to turn its Pupil downwards, for the better receiving of the Rays of Light, which could not be performed by any of the other four Muscles, (as Mr. Cowper has very well observed.) And both of them are an Axis for suspending the Globe, by which, in its almost continual Motion, 'tis moved the more easily, as has been ingeniously observed by Mons. dela Hire.

Now the Globe of the Eye is of a Sphærical Figure; in it are contained the principal Instruments of Vision; 'tis composed of Coats and Humours.

The first Coat is the Conjunctiva; it makes the White of the Eye; it hath been already described: It is full of small Veins and Arteries, which appear big in an Ophthalmia or Inflammation of the Eyes.

Of the Conjun-

The

The fecond is call'd Sclerotica; 'tis Sclerotithick, hard and smooth, opake behind, ca. but transparent before, where it makes the

Third Coat, call'd Cornea, because it Cornea, is transparent, like the Horn of a Lantern, in the forepart of the Eye; which is surrounded by the White of the Eye; It has a greater Convexity than the rest of the Globe of the Eye, and is composed of several parallel Lamina, which are nourished by many Blood-Vessels, so sine, as not to hinder even the smallest Rays of Light from entering the Eye; and it has a most Exquisite Sense, that upon the least Pain, the Tears might be squeez'd out of the Lachrymal Gland, to wash off any Filth, which, by sticking to the Cornea, might render it opake.

The Fourth is the Choroides; it lies Choroiunder the Sclerotica; 'tis much thinner des.
than it: It hath a great number of
Blood-Veffels which come from the second, and which are spread upon it; as
also several Glands, which separate from
the Blood-Veffels a black Liquor, which
tinctures all this Membrane internally,
which is otherwise of a whitish Colour.
This Coat is open, or has a Hole before,
for the Passage of the Rays of Light,
call'd Pupilla. That part of this Coat,
which makes the Circumference of this

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Hole, and which lies upon the Sides of the Chrystalline Humour, is

Uvea.

The Fifth Coat, call'd, Uvea, which is made of circular and strait Fibres; it contracts and dilates, according to the different Impressions of Light and of Objects.

Uris. Objects

The Iris is the out-fide of the Uvea, where the different Colours appear. On the infide of the Uvea, from its Circumference, which joins the Choroides, rifes the Ligamentum Citiare. It is made of short Fibres which run upon the forepart of the Glaffy Humour to the edges of the Chrystalline, like Lines drawn from the Circumference to the Centre. By the Contraction of these Fibres the forepart of the Eye is made more prominent, and the Ratina pressed further back from the Chrystalline Humour, or the Axis of Vision is lengthned when Objects are placed too near the Eye.

Retina.

The Sixth is the Retina, so call'd, be cause it resembles a Net, which covereth the bottom of the Cavity of the Eye: It is a fine expansion of the Medullary Fibres of the Optick Nerve upon the Surface of the Glassy Humour, as far as the Ligamenta Ciliaria: "Tis on this Coat that the Impressions of Objects are made.

ch makes the Ordusatoresis.

The

The Humours of the Eye are three: Of the A-The first is call'd the Aqueous; it lies in queeus the forepart of the Globe, immediately Humour, under the Cornea; this Humour is thin and liquid, of a spirituous Nature, for it will not freeze in the greatest Frost. This evinces the necessity of a continual Supply for this Humour, which, in effect, it hath. For if the Cornea be pricked, and this Humour squeez'd out, it shall be restor'd again in the space of tenor twelve Hours.

The second Humour is the Chrystal-Chrystalline; it lies immediately next to the A-line Huqueous, behind the Uvea, opposite to the mour. Pupilla, nearer to the forepart than the back part of the Globe; it is the least of the Humours, but much more solid than any of them: Its Figure, which is Convex on both Sides, resembles two unequal Segments of Spheres, of which the most Convex is its back side, which makes a small Cavity in the Glassy Humour in which it lies: It is covered with

a fine Coat, call'd Aranea.

The third is the Glassy Humour; it Of the Vihath a great resemblance to the White trious Huof an Egg; it filleth all the hind-part of mour, the Cavity of the Globe. It is in a greater abundance than the other two. It is ticker than the Aqueous, but thinner than the Chrystalline Humour. It is con-

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tained in a very fine Coat of the same Name. It gives the Spherical Figure to the Eye. Upon its back part the Retina is spread, which it holdest from the Chrystalline Humour at a Distance requisite to receive the Impression of Ob-

jects diffinctly.

The Optick Nerves pierce the Globe of the Eye a little on the infide of the Optick Axes. Their External Coat, which is a Production of the Dura Mater, is continued to the Schrotis, as their Internal from the Pia Mater is to the Choroides; and their Medullary Fibres passing through all, are expanded into the Retina, upon which the Images of Objects are painted. The Centre of this Expansion is infensible, and all Rays which fall upon it are loft, and confequently, that point of the Object from which these Rays come is invisible to that Eye, as is evident from that famed Experiment of Monfieur Mariote. The Reason of this Insensibility proceeds probably from the Blood-Veffels which enter with the Optick Nerve, and cover this part of the Retina. But whatloever its Caufe is, we are extreamly obliged to the Maker of our Eyes, that the Optick Nerves are inferted on the infide of the Optick Axes; for if they had pierced the Globe of the Eye in the

the Optick Axes, then the middle Point of every Object, had been invisible; and where all things conduce to make us fee best, there we had not feen at all. We must likewise have lost some part of an Object, if the Optick Nerves had been placed on the outlide of the Optick Axes: because an Object may be so placed, as that all the Rays which come from one Point may all upon the outside of both Eyes; but it is impoffible that they should fall upon the infide of both Eyes, and therefore that Point which is lost in one Eye, is visifible by the other.

The Veffels of the Eyes are Branches Of the of the External Carotides and Jugulars, Veffels of which are distributed upon the External the Eye .-Parts of the Eyes, and a Vein which opens into the Superiour Sinus of the Dura Mater, in the Basis of the Skull, and an Artery from the Internal Carotid. They accompany the Optick Nerves, and are distributed on the Muscles and

Globe of the Eye.

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There are also some Lymphaticks which accompany the Blood-Veffels.

The Nerves of the Eyes are

The Optick Nerves; they are pretty of their big and round. The third Pair of the Nerce . Brain, call'd Motorii; the fourth Pair, call'd Pathetici: The first Branch of the

fifth Pair, call'd Ophthalmicus; and the fixth Pair, are all bestowed on the Mu-

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fcles of the Eyes.

Of Vision. All the Rays

All the Rays which come from one Point of an Object, are, by the Cornea and Humours of the Eye united in a Point of the Retina, which is in a strait Line, drawn from the same Point of the Object, through the Centre of the Eye, and consequently all the Rays, which come from all the Points of an Object, are united on the Retina, in the same Order and Proportion as the Points of the Object are from whence these Rays come. Therefore the Impression which these Rays make upon the Retina, must be the Image of the Object.

Thus, in General, Vision is performed. But now let us see what the several Parts of the Globe conduce in this Action. We have said, the Cornea was more Convex than any other Part of the Globe; by which means, all the Rays are gathered to pass through the Pupilla, and none of them are lost upon the

Uvea.

How the Parts of the Eye contribute toit. The Aqueous Humour being the thinnest and most liquid, easily changes its Figure, when either the Ligamentum Ciliare contracts, or both the Oblique Muscles squeeze the middle of the Bulb of the Eye, to render it oblong when Objects are too near us. The straight Fibres of the United dilate the Pupilla, when there are but few Rays of Light; and the Circular Fibres contract it, when they are too many. When the Pupilla is contracted, we see most distinctly; when it is dilated, we see most clearly. The Glassy Humour keeps the Chrystalline Humour at such a distance from the Resina, as is necessary for uniting the Rays which come from one Point of the Object, exactly in one Point of the Resina.

The Impression of the Object is made upon the Retina. The Choroides is tinctured black, that the Rays of Light which pass through the Retina, may not be resected back again, to consuse the

Image of the Object.

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Being distinct, Vision confists in the Union of all the Rays which come from one Point of an Object, exactly in one Point of the Retina; and that the Rays which come from Objects at different distances, are united at different distances, behind the Chrystalline Humour: They cannot both be united exactly upon the Retina; therefore the Eye cannot see equally, distinctly at the same time Objects at different distances. It is for this Reason that the Globe of the Eye moves so quickly, and almost continually, and that the Muscles of the Eyes have such

a great quantity of Nerves to perform their Motion.

When the Globe of the Eye is flat, as happens sometimes in Old Age, that the Rays pass the Retina before they unite, in such a Case there is no distinct Vision; and such as have this defect, are call'd Presbyte. And if, on the contrary, the Globe of the Eye be so Convex as to unite the Rays before they come to the Retina, neither is there any distinct Vision, and such as have this defect are call'd Myopes.

## SECT. V.

Of the Ean.

Of the External Ear. THE Ear is divided into the External and Internal. The External Ear (whose Parts have already been described) is composed of the Skin, a Cartilage, and a little Fat. The Skin of this Part is thin and smooth; its Glands seem to differ from the milliary Glands of the Skin, in that both in Young and Old they frequently flow with an Unchaous Humour, which dries to a sort of Scurf in the Concha. These Glands are call'd by Valsalva, Glandula Sebacea. The Skin sticks close to the Cartilage by means of the Membrana Adaposa, whose Cells

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contain no Fat but in the Lobe of the Ear, where the Cartilage does not reach. The Vessels of the External Ear are Arteries from the Charotid Veins, which go to the Jugulares, and Nerves from the Portio Dura, and second Pair of the Neck.

The External Ear is tied to the Os Pesrofum by a firong Ligament which comes from the backfide of the Pinna. Though the Ear has but a very obscure Motion, yet it has two Muscles: The first arises from the outfide of the Frontal Muscle, where it joins the Crotaphite, and is inserted into the upper and backpart of the Pinna. The second arises from the upper and foremost part of the Processus Mammillaris, and is inserted into the middle and back part of the Concha. The first should draw the Ear upwards, and the fecond downwards and backwards; but the continual binding of our Ears when young, deprives us of their Use. 100000011441502000

The Use of the External Ear is like a Tunnel to gather the Sounds, which by its Ridges and Hollows are directed to the Meatus Auditorius, the first part of of the Internal Ear. This is a Conduit Meatus which goes from the middle of the Con-Auditoricha to the Tympanum: It is near an Inch us, long, about 3 or 4 Lines, or tenth Part of an Inch wide, and its Passage is not straight

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Araight but crooked, paffing first upwards, then downwards; then it has a fmall Tendency upwards again, and the lower part of its Extremity bends a little down to the Oliquity of the Membrana Tympani. The beginning of this Passage is Cartilaginous, being a Continuation of the Concha contracted; the end of it is Bony, being in the Temporal Bone, which makes the greatest part of the upper and back part of the Meatus, as the Carrilage does of the lower and fore part. The whole Cavity within is lined with a Membrane. which feems to be a Continuation of the Skin which covers the Auricula, and which grows thinner and thinner as it approaches the Tympanum. On the back fide of this Membrane, there is a great Number of little Glands, whose Excretory Ducts bring into the Meatus a Yellow Excrement, whose Bitterness and Viscidity hinder Infects from approaching the Membrana Tympani, which it likewise preferves against the Injuries of the Air. The Cartilage is always flit, and frequently in more than one place. The Meatus has the fame Veffels which the External Ear has, and both have a Vein which paffes through the eleventh of the External Holes of the Cranium, and discharges its self into the Lateral Simus's. The

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The inner Extremity of the Meaths Of the is closed with a thin transparent Mem-Membrane brane, of an Oval Figure stretched out of the Tyme like the Head of a Drum, making an panum. obtule Angle with the upper and back part of the Meaths, and an acute with the lower and fore part. This is the Membrana Tympani, which is fet in a Bony Circle of the Temporal Bone, and which wants about half a Line of being a compleat Circle. Valfalva fays, that this Membrane is double, being compofed of the Membranes which line the Cavities of the Meatus and the Tympanum. The Handle of a small Bone called the Malleolas, is tied to this Membrane, which it draws fomewhat inwards, making it a little Concave towards the Meatus Auditorius: And there runs a fmall twig of a Nerve from the fifth Pair upon its infide, call'd Chorda Tympani. The upper Edge of this Membrane being sometimes not quite closed to the Bone, gives a Passage for the Air from the Mouth to the External

Behind this Membrane there is a Of the pretty large Cavity call'd the Tympa-Tympa-num; it is about three or four Lines num. deep, as much wide, and between two and three high. It is lined with a fine Membrane, on which there are feveral

Veins,

Veins and Arteries. It is always full of a purulent Matter in Children. In this Cavity there are four small Bones, of which,

Of the

The first is the Mallevins or Hammer, Malleolus, fo call'd, because of its Shape. Its Head has on its lower fide two Protuberances and a Cavity whereby it's joined to the Incus by Ginglymus: Its Handle, which is pretty long and small, is fastened to the Membrana Tympani: Its whole length is about three Lines or a little more. Near its Head it has two small Processes, and it is moved by three Muscles.

Its Musseles.

The first is call'd the Externus; it arifes from the Upper and External Side of the Meatus Auditorius, and is inferted into the upper and lower Procels of the Malleolus, which it draws outwards. This is necessary, when Sounds are too great, which might break the Membrana Tympani.

The second is the Obliquus; it lies in the External Part of the Conduit which goes to the Palate, and entring the Barrel it is contained in a Sinuofity of the Bone by the upper edge of the Menbrana Tympani, and is inferred into the flender Process of the Hammer, affishing

the former Muscle in its Action.

The third is the Internus, which arifes from

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from the Extremity of the bony part of the Conduit which leads to the Fauces, and lies in a Sinus of the Os Petrofum till it passes over a little rising of the Bone at the Fenestra Ovalis, to be inserted into the posterior part of the Handle of the Malleolus. This Muscle, by pulling the Hammer inwards, distends the Membrana Tympani.

The second small Bone is call'd Incus, Of the Inthe Anvil: It has a Head and two Legs. cus. Its Head which is near two Lines long, above one broad, and but half a Line thick, has a Protuberance, and two Cavities, whereby it is articulated with the Hammer; the shorter of its Legs is tied to the side of that Conduit which goes to the Processus Mammillaris, and its longer Leg to the Head of the third Bone, call'd

The Stapes or Stirrop, because of the its resemblance. "Tis of a trian-stapes gular Figure, being made of two Branches set upon a flat Basis, which stands upon the Foramen Ovale. The space between the two Branches is filled up by a fine transparent Membrane; the union of the two Branches is call'd the Head of the Stirrop, in which there is a small Cavity, in which lies the fourth Bone. The height of the Stapes is a Line and a half, the length of it is above

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a Line, and the breadth half a Line. There is a small Muscle which arises our of a small Canal in the bottom of the Tympanum, and which is inferted into the Head of the Stirrop.

Of the Os The Os Orbiculare, which is a very Orbicula-small Bone, being Convex on that fide re. which is received in the Cavity of the Head of the Stirrop, and hollow on the other fide, where it receives the long Leg of the Anvil, which is only joined to the Stirrop by means of this fourth

Bone and the said to the

Of the Holes in panum.

Befides thefe Bones, there are fevera Holes in the Tympanum. The first is it the Tym- its fore part nearest the Membrana Tym pani. It is the entry to the Sinus in the Mammillary Process. The second is the Orifice of a Conduit which leads to the Palate of the Mouth. The beginning of this Paffage is very narrow and bony the middle is Cartilaginous, and its ex tremity, which opens near the Uvula, above four Lines wide, Membranous and dilated by fome Muscular Fibres as Valfalva fays; and they open the ex tremity of this Passage, either when w open our Mouths to hear more disting ly, or when it is necessary there should be a free Communication between the External Air, and that in the Cavity the Tympanum. The third and fourth

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re in the Internal Process of the Os Peofum. The one is called Fenefira Ovas; the basis of the Stirrop stands upon ; it is the entry to the Vestibulum. The ther is call'd Fenestra Rosunda; it is coer'd by a fine Membrane, inchased in rist of this Hole: It leads to the Coblea.

The Vestibulum is a Cavity in the Os Of the Veetrosum, behind the Fenestra Ovalis, it is stibulum, bove two Lines broad, and as much ong, and a Line and a half high. In it pen the Semi-circular Pipes of the Layrinth: The upper turning of the Coblea, and the Auditory Nerve at five mall Holes.

The Labyriath is made of three Semi-Of the Laircular Pipes above half a Line wide, byrinth.
xcavated in the Os Petroficm; they open
y five Orifices into the Vestibation. That
which is call'd the Superious Pipe,
which is generally about; or 6 Lines
ong, joins one of its Extremities with
one of the Extremities of that which is
talled the Inferious Pipe, (which is about fix or feven Lines long) and these
two Extremities open by one Orifice,
but the middle Pipe opens at each end
by it self into the Vestibation. This is about four or five Lines long.

The last Cavity of the Ear is the Corb- Of the lea; it refembles a Snail's Shell. Its Ca-Cochleannal,

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nal, which winds in a Spiral Line, in divided into two, the upper and lower by a thin Lamina Spiralis, of which that part next the Axis is bony, but extream ly brittle, and that next the outer Shell is Membranous, appearing to be only made of the Auditory Nervel- The up per Canal opens into the Tympanum and the lower into the Vestibulum. This is narrower than that, especially toward the Bafis of the Cochlea, where each about a Line wide, and the Bafis it fel is about four Lines in Diameter.

Of the Veffels of the Ear.

The Veffels of the Internal Ear are A teries and Veins, from the Internal Care tidale and Jugulars. The Nervus Audit rius enters by the Hole in the Interna diane Process of the Os Petrofum. It confid of two Bundles, of which one is han the other foft. Five Branches of the Portio Mollis enter the Vestibulum, as ha been faid, and form a delicate Web which fends Slips, which run through the three Semi-circular Canals, and the reft of the Portio Mollis enters the Cochlea at the Cen ter of its Basis, and turns with the Spi ral Line, of which it probably make the Membranous part. The Portio Di ra passes through its proper Passage to be diffributed among the External Part about the Ear. Preferation of the position of the Coultry.

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A Sound is nothing but a certain Re- of Hearraction or Modulation of the Externaling. ir, which being gathered by the Exernal Ear, passes through the Meatus duditorius, and beats upon the Membrana lympani, which moves the four little Bones in the Tympanum. In like maner as it is beat by the External Air, hefe little Bones move the Internal ir which is in the Tympanum and Vestiulum: which Internal Air makes an inpression upon the Auditory Nerve in he Labyrinth and Cochlea, accordingly as t is moved by the little Bones in the sympanum: So that, according to the arious Refractions of the External Air, he Internal Air makes various Impresions upon the Auditory Nerve, the mmediate Organ of Hearing; thefe lifferent Impressions represent different Sounds. The curious Structure of the Labyrinth and Cochlea, render the weakof Sounds audible; for the whole Organ of Hearing being included in a fmall pace, had the Auditory Nerve run in a Braight Line, the Impressions had been nade but upon a very small part of it, and the strength of the Impression beng, Cateris Paribus, always as the number of Parts upon which the Impressi-Parts on is made, Sounds which are now low could not have been heard at all. If the Auditory A

Auditory Nerve had, like the Retina been expanded into a large Web which had covered or lined fome wide Cavity the Impressions of Sounds even in the Case had been much weaker than the are now : For this large Cavity had g ven room to the Sounds to dilate, an all Sounds grow weaker as they dilate Both these Inconveniencies are prevent ed by the prefent Structure of the Lab rinth and Cochlea, whose Channels, b their winding, contain large Portions the Auditory Nerve, upon every Poil of which the smallest Sound being once impressed becomes Audible, as by their narrowness the Sounds are hi der'd from dilating, and the Impres ons made upon the Nerve by the fit Dilatations, which are always the ffrom eft. The strength of the Impression narrow Channels is likewise increase upon the account of the Elasticity the Sides of the Bony Channel, while receiving the first and strongest Impulse of the Air, do reverberate them mon strongly upon the Auditory Nerve. mit

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#### which they worth the heat they shall reference his his SECT. VI.

### carla street interpretation from based inch. Of the Nofe.

no there is a second contract that a story THE Nose may be divided into two Parts. The External and Internal. The External Part is covered with the Skin and some Muscles, of which afterwards. Its upper part confifts of two Bones closely joined together on their upper Side. Its lower Part is made of Poir our Cartilages, of which the first two re fixed to the lower ends of the afore faid Bones: they are also joined together on he upper Side; they are pretty broad, prefe and as they approach the tip of the Nose, hey grow thinner and fofter. The other two lie upon the lower ends of the first two, to which they are tied by a Membrane; they are called Narium Ala.

The Cavity made by these Bones and four Cartilages, is divided in its middle into two Nostrils, by a Partition, of which the upper end is bony, the lower end Cartilaginous. The fleshy Extremity of this Cartilage is call'd Columna.

The upper end of each fide of this CT Cavity divides into two, of which one goes up to the Os Spongiofum, the other goes down into the Fauces, and opens behind the Palate, by which means we breath breath through our Nostrils. At the lower end of this Cavity there are two small Holes which pierce the Bone of the Palate, and open in one behind the Dentes Incifivi; they carry the thin Rheum of the Nostrils into the Mouth.

The Cavity is cover'd by a pretty thick and glandulous Membrane; its Glands separate that Matter which we call Muccus into the Nostrils. On the lower end of this Membrane there grow feveral Hairs call'd Vibriff; they, with the Mucus which the Glands separate, flop any Filth from ascending too far into the Nostrils.

By the Internal Part of the Nose, we understand the immediate Organ of Smelling; it lies in the upper part of the Cavity of the Nostrils; it is made of the Os Cribriforme, and its Productions, the Os Spongiofum, of which each Lamina is cover'd with a fine Membrane, upon which the Fibres of the Olfactory Nerve which pale through the Holes of the 01 Cribriforme, and the Fibres of the first rom Branch of the fifth Pair, which come Olfa from the Orbit, are spread.

In this Membrane there are many Caro fmall Glands which separate an Humour Bran which moistens it, and stops the Exha-Veir lations of odoriferous Bodies, which Som make their Impression upon the Olfa Bodi dicyle

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Gory Nerves which are spread upon it. Hounds and other Beafts which have a more exquisite Smell than Men, have also many more Lamina cover'd with such a Membrane.

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There are feveral Conduits which o- Of the pen between these Lamina. The first Conduits and second are the Dustus Lachrymales, of which owhich we have spoken before. The third pen in tha and fourth come from the Sinus Frontales, Nofe. The fifth and fixth come from the Nut with of the second Bone of the upper Taw. rate, The feventh and eighth come from the far

Cells of the Os Spongiofum; they pierce the Membrane which covers the first or appermost Laminæ: And the ninth and enth come from the Sinus in the Os Sphert of noides. All these Conduits carry the Li-made quor which is separate in their Cavities ions into the Nostrils, for the moistening its mine Membranes, which otherwife would dry upon oo much by the Air which we breath hrough our Nostrils.
The Vessels of the Nose are Arteries Of the

first from the Carotidals which pass with the Vessels of Olfactory Nerve, they are distributed the Nose. n the Internal Nose: The External,

many Carotidal and Jugular, and the fecond mour Branch of the fifth Pair, give Arteries, Veins and Nerves to the External Nofe. Some give an account why the smell of Olfa. Bodies, which confist of acrimonious Story

Parts, draw Tears from the Eyes; and why the want of Taste does ordinarily accompany the want of Smelling, by the Communication of the Branches of the Fifth Pair of Nerves, which are distributed through these three Senses.

#### SECT. VII.

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### Of the Mouth and Tongue.

Of the Lips and Gums. THE Parts of the Mouth, are the Lips, the Gums, the Palate, the Uvula, and the furrounding Glands.

The Lips are made up of feveral Mufcles, of which afterwards. Their Use is to shut the Mouth, and to articulate

the Voice.

The Gums are a hard fort of Flesh, formed by the union of two Membranes, one of which is a Production of the Perfosteum, and the other of the Internal Membrane of the Mouth: They are set about the Teeth, to keep them firm in their Sockets.

Of the Palate.

The Palate or Roof of the Mouth is covered with a pretty thick Membrant, which is continued to the Tonfils; upon it there are a great number of little Glands whose Excretory Ducts piercing it like a Sieve; discharge a Liquor for the moistening and dissolving of the Aliments.

t

It is an Error, to think that the Palate tastes; for by it it's impossible to distin-

guish the most acrid Substances.

The Uvula is a Reduplicature or Pro-Of the duction of the Internal Membrane of the Uvula and Mouth; its Substance is very lax, and its Musit has a number of small Glands as in cles. the Palate: It is somewhat long, of a Conick Figure, it hangs from the Roof of the Mouth, at the Extremity of the Passage which comes from the Nose, above the Larynx, between the Tonsils.

It is moved by two Pair of Muscles,

which are,

The Pterigostaphilinus Externus; it arifes fleshy from a small Protuberance, upon the under side of the Body of the Os Sphænoides, and goes directly to be inferted into the hind part of the Uvula.

The Pterigostaphilinus Internus arises from the same Protuberance of the Os Sphænoides, and growing into a small round Tendon, which passes over a small Process, like a Hook, of the Processis Pterigodæus, from thence reverting, it's inserted into the fore part of the Uvula.

When the first of these Muscles a Steth, it pulleth the Uvula backwards; when the second contracteth, it pulleth the Uvula forwards, because of the Pulley through which its Tendon passes, which alters the Direction of its Motion, both

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nents.

which Motions are necessary for the articulating the Voice, and in Deglutition, that nothing may regurgitate into the Nose which we take by the Mouth.

Of the Pa-

The Glands, which are the Sourses of the Spittle, which discharges it self into the Mouth, are in great number, of which the principal are the Parotides, one on each side, situated under the Ear, above the Musculus Masseur; they are of the Conglomerate sort, being made up of a great number of smaller Glands, each of which sends out a small Excretory Duct, and they all unite and form one Channel call'd Dustus Salivalis Superior, which running over the Cheek, pierces the Buccinator, and opens in the Mouth. When the Masseur acteth in Massication, it presses the Saliva into the Mouth.

Of the Maxillares. The Maxillares, which are fituated within the Under Jaw, one in each fide, are also of the Conglomerate fort; the Excretory Pipes of their small Glands unite, and form two Ducks, which both together open under the tip of the Tongue, on the inside of the Dentes Incisivi, where they have each a small Papilla at their Orifice. When the Muscels of the Tongue or lower Jaw act, they compress these Glands.

Of the Sublinguales.

The Sublinguales are one on each fide of the Tongue; they have sometimes

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two Excretory Ducts, as the former, formed by the Union of that of each small Gland; they run on each side of the Tongue, nearitstip, where they open into the Mouth, just by the former, with which sometimes they join: Sometimes these are wanting, and then each little Gland has a Duct which opens under the Tongue: When the Mylohyoidaus acteth, it compresses them.

The Tonfille, or Almonds, are two Of the round Glands placed on the Sides of the Tonfille Basis of the Tongue, under the common Membrane of the Fauces, with which they are cover'd; each of them hath a large Oval Sinus, which opens into the Fauces, and in it there are a great number of lesser ones, which discharge themselves through the great Sinus, of a mucous and slippery Matter, into the Fauces, Larynx, and Oesophagus, for the moistening and lubricating these Parts. When the Muscle Oesophagus acteth, it compresses the Tonsille.

Besides these, there are a great number of little Glands spread upon the Cheeks and Lips, call'd Glandule Buccales and Labiales, whose Excretory Channels open into the Mouth, and all of them separate a Sort of Saliva or Spittle, which conduces to the Dissolution of the Aliments.

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The Tongue is connected in the Mouth to the Os Hyoides, and to the Larynx, by a membranous Ligament which is in the middle of its lower Side. Sometimes this Ligament is continued to the tip of the Tongue, and then it hindreth Children from Sucking; therefore in such a case it should be cut.

Of the Membranes and Papillæ of the Tongue.

The Tongue is covered with two Membranes. The External hath upon its upper part, and particularly towards the tip of the Tongue, a great number of Papille, of a Pyramidal Figure; they fland not up flraight, but encline towards the Basis of the Tongue; they appear not so plainly in Men as in Brutes, in some of which last they grow Cartilaginous. Each Papilla has a small Root, which makes a small Hole in the viscous Substance, which lies between the two Membranes. In Men, the chief Use of these Papilla Pyramidales seems to be for preferving the Papilla Nervola, which are of a fofter Substance, that they be not hurt by the hardness or roughness of the Aliments: And in Beafts which feed upon Grass, which they gather together with their Tongue, these Papilla are like to many Hooks, for the grafping, cutting, and pulling of the Grass and perhaps, by their roughness, rubbing upon the Palate, they conduce to press

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press the Spittle out of the Glands. Towards the Basis of the Tongue are to be seen several small Glands like those of the Cheeks.

Under the External Membrane there lies a thin viscous Substance, which is white on that Side next the External Membrane, and black on that Side next the Internal. When the Tongue is boiled, this Substance hardens, and is like a Searce, being full of small Holes made by the Roots of the Papille Pyramidales.

The Internal Membrane is thin and fost; uponit there appear several Papillar made of the Extremities of the Nerves of the Tongue, therefore they are called Nervosa: They are situated upon the Sides of the Tongue, but chiefly towards its tip; they resemble the small Horns of a Snail; for their Extremities are round, and bigger than the rest of their Bodies. The Extremity of each Papillar pierces the External Membrane of the Tongue. They quit those Holes, and remain on the Internal Membrane, when the External is raised. These Papillar are the immediate Organ of Tasting.

The Substance of the Tongue is musculous, being made of Plans of Fibres of different Directions.

The first or External Plan is made of straight Fibres, which surround the L 4 Tongue,

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Tongue, reaching from its Basis to its Point: When they contract, they shorten the Tongue. Under them there are feveral Plans of Fibres, which run from one edge of the Tongue to the other; they draw the edges of the Tongue together. There are also several Plans of Fibres, which run from the under to the upper Side of the Tongue: When they contract, they make the Tongue broad and thin. These two forts of Fibres lie Stratum Super Stratum, from the tip of the Tongue to its Basis; first a Plan of one fort, and then a Plan of the other fort. There is some Fat betwixt these Fibres, but chiefly towards the Basis of the Tongue.

Its Vessels. The Vessels of the Tongue are Veins from the Jugulars, called Ranulares: It has Arteries from the Carotidals, and Nerves from the Fifth and Ninth Pair.

The Muscles of the Tongue are three

Of its TI

The Stylogloss; it arises fleshy from the Processus Styloides, from thence descending, it is inserted into the Root of the Tongue. It draws the Tongue upwards.

The second Pair is the Geniogloss; it arises from the inside of the forepart of the lower Jaw, and is inserted into the Root of the Tongue; it pulls the Tongue out of the Mouth.

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ie ie The third is the Ceratogloss; it arises broad and sleshy from the Sides of the Os Hyoides, and is inserted into the Root of the Tongue; it pulls the Tongue directly into the Mouth. The Fibres of this Muscle which are nearest the Extremities of the Os Hyoides, were only call'd the Ceratogloss, and those which were nearest the Basis of the Os Hyoides were call'd the Basis of the Os Hyoides were fame Plan, and their Fibres have the same Plan, and their Fibres have the same Direction, Origination, and Insertion.

The Tongue is not only moved by Of the these Muscles, but also by a Bone call'd Os Hyoi-Os Hyoides. Now this Bone lies at the Root of the Tongue: Its Figure is like the Greek Letter v, it is composed ordinarily of three Bones, that in the middle makes its Basis, it is shorter than the other two; it is Convex without, but Concave within; the other two are joined to its two ends by two intervening Cartilages; they are much longer than the first; they have each a Cartilage at their Extremities, and they are call'd the Cornua, or Horns.

The Basis of this Bone is join'd to the Root of the Tongue, and its Horns are join'd to the upper Angles of the Carrilago Thyroides, and by two small and tound

round Ligaments to the Processus Styloides of each Side. This Bone is moved, and with it the Tongue, by five Pair of Muscles.

Of its Mufcles. The first is the Geniobyoidaus; it arises stelly from the forepart of the lower Jaw internally, and is inserted into the Basis of the Os Hyoides. It pulls the Os Hyoides and the Tongue upwards and forwards.

Its Antagonist is the Sternohyoidaus; it arises from the inside of the Clavicula, and ascending above the Sternothyroidaus, it's inserted into the Basis of the Os Hyoidaus, which it pulls downwards.

The third is the Mylohyoideus; it ariseth fleshy from the inside of the lower Jaw, under the Dentes Molares, and is implanted into the Sides of the Basis of the Os Hyoides: It draweth this Bone and

Tongue obliquely upwards.

Its Antagonist is the Coracobyoideus; it is wrong named, for it arises not from the Processus Coracoides, but from the upper edge of the Scapula, near its Neck, and ascending obliquely under the Mastoideus, it is inserted into the Os Hyoides, which it pulls obliquely downwards. The Belly of this Muscle is a little tendinous in its middle, that the Vessels which go to the Head be not compressed when it asteth.

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The fifth Pair is the Stylobyoideus; it arises from the Processus Styloides, and descending obliquely, is inserted into the Horns of the Os Hyoides, which it draws to one Side, and a little upwards.

The Belly of the Muscle is perforated for the Passage of the Tendon in the

middle of the Digastricus.

## A LIST of the different forts of Glands in the Body.

- I. Cerebri.
- 2. Plexus Choroidei.
- 3. Sebacea.
  - 4. Meatus Anditorij.
    - 5. Ciliares
  - 6. Lachrymales.
    - 7. Humorem Aqueum.
- 8. Chrystallinum.
  - 9. Vitreum. 10. Atrum Choroidis.
    - 11. Nafales
    - 12. Buccales, Labiales, Palatine.
      - 12. Parotides, Maxillares, Sublinguales.
      - 14. Tonfillarum.
      - 15. Oefophagee.
        - 16. Afpera Arteria.
        - 17. Pericardij.

18. Mam-

# A List of the Glands.

18. Mammarum.

19. Ventriculi.

20. Inteffinorum.

21. Pancreatis.

22. Hepatis.

23. Vesica Fellis.

24. Renum.

25. Renales.

26. Ureterum.

27. Vesica Urinaria.

28. Urethra.

29. Testiculorum.

30. Prostatarum.

31. Uteri.

32. Vagine.

33. Lymphatice.

34. Pinguedinales.

35! Medullares.

36. Artuum,

37. Cutis Milliares.

All these Glands seem to me to separate different Humours from the Blood, but if any one shall contest the Existence of some of them, or maintain that several of them separate the same sort of Humour, I shall not dispute it.

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Of the BONES.

### SECT. I.

Of the Bones in general.

Hough after the Description of the Three Cavities it is usual to give the Myology; 'yet because it cannot be understood without a perfect Knowledge of the Bones, there-

fore we shall begin with them.

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The Bones are made up of hard Fi-Of the bres, tied to one another by small trans-Nourish-verse Fibres, as those of the Muscles are. ment of In a Fætus those Fibres are porous, soft, the Bones, and easily discerned. It is probable that they are nourished by the Serous or Lymphatick Part of the Blood, which is brought to them by the Arteries, and carried back by the Veins. As their Pores fill with a Substance of their own Nature, such as we suppose the Lympha to be, so they encrease, harden, and grow close to one another; but when their Pores are full of this Substance, then

then the Bones are grown to their utmost extent, hardness, and solidity; their Blood-Vessels being compressed on all Sides by their bony Channels, bring no more Blood than what is sufficient to supply the Places of their decaying Particles.

Of the Use of the Marrow.

All the Bones of the Body which have any confiderable Thickness, have either a large Cavity, or they are Spongeous, and full of little Cells: In both the one and the other there is an Oleaginous Substance call'd Marrow, contained in proper Veficles or Membranes, like the Fat. In the larger Bones, this fine Oil, by the gentle Heat of the Body, is exhaled through the Pores of its small Bladders, and enters some narrow Pasfages, which lead to fome fine Channels excavated in the Substance of the Bone. according to its length; and from thefe other cross Passages (not directly oppofite to the former, left they should weaken the Bone too much in one place) carry the Marrow still further into more Longitudinal Channels placed nearer the Surface of the Bone. All this Contrivance is, that the Marrow may fupple the Fibres of the Bones, and render them less apt to break.

All the Bones of the Body, except the Teeth, and where the Bones are arricu-

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ute late to one another, are cover'd with a thin, but close and strong Membrane, call'd Periosteum; it has an exquisite Sense, which gives me ground to think that it is an Expansion of some of the tendinous Fibres of the Muscles. Its Use is to sustain the Vessels, which enter the Substance of the Bones with their Nourishment.

Each large Bone is much bigger at its Extremities than in the middle, that the Articulations might be firm, and the Bones not eafily put out of Joint: But because the middle of the Bone should be strong, to sustain the weight of the Body, and refift Blows and Falls, therefore the Fibres there are closely compacted together, supporting one another; and the Bone is made hollow, and confequently not fo eafily broken as it must have been, had it been folid and smaller: For of two Bones of equal Length and equal Numbers of Fibres, the Strength of the one will be to the strength of the other as their Diameters.

On the external Surface of the Bones, Of the Cathere are several Cavities and Protube-cities and rances. The Cavities are of two sorts, Protube-either narrow and shallow, or wide and rances of deep. The first sort is called Glene; the Bones, the second Cotyle. But in describing the

Bones

Bones in particular, we shall also describe their Cavities. The Protuberances are also of two forts, viz. Apophysis and Epiphysis. The Apophysis is a Protuberance made by the Fibres of the Bone; an Epiphysis is a Protuberance made by a fmall Bone fet upon the Extremity of a bigger Bone, which, as we advance in Age, unite in one. Both the one and the other are ordinarily upon the Extremities of the Bones, and they are either for the Infertions of Muscles, whose Force they greatly augment, or for the Articulation of the Bones. All their difference is from their Figure. If it be a large and round Protuberance, it is call'd Caput; and the Part immediately under it, Cervix : But if it be small and round, then it is call'd Condylus. If it be a sharp Protuberance, then it is call'd Corone, Styloides, Coracoides, &c. according to its Figure.

Analysis of In the Bones there is much Volatile the Bones. Salt and Spirit, which are very subtile and penetrating; some Sulphur which is very slinking, a little Phlegm, and

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much Earth.

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# SECT. H.

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Of the Cartilages and Ligaments in general.

Cartilage is a smooth and solid Body, softer than a Bone, but harder than a Ligament. In it there are no Cavities nor Cells for containing of Marrow, nor is it covered with any Membrane to make it femible, as the Bones are. The Cartilages have all a natural Refort, by which, if they are forced from their Natural Figure or Situation, they return to it of themselves, as foon as the Force is taken away. They are chiefly in those Places where a small and easie Motion is required, as in the Ears, Nose, Larynx, Trachea Arteria and Sternum; and their Natural Elasticity ferves instead of Antagonist Muscles. They cover also the ends of all the Bones, which are joined together for Motion. First, Because they are smoother than the Bones. Secondly, Because they are without Sense. And Thirdly, Being fofter than the Bones, the Attrition which is made by the motion of the Joint, is the more easily supplied. In it and riele to rol side bas fradelinen, the Halt and Socket.

A

Of the

A Ligament is a white and folid Body, fofter than a Cartilage, but harder than a Membrane; they have no conspicuous Cavities, neither have they any Sense, left they should always suffer upon the Motion of the Joint. Their chief Use is to fasten the Bones, which are articulated for Motion together, left they should be dislocated in any violent Mo-

#### SECT. III

Of the Articulation of the Bones.

THE Bones are articulated or joined to one another, either with a ma-Foining of the Bones, nifest Motion, or with a finall and obfcure Motion, or without any Motion at all. The first fort of Articulation is call'd Diarthrofis : The second, because of the Cartilage by which it is performed, is call'd Synchondross: And the last Synarthrofts.

Of the Diarthrofis there are two forts, viz. Enarthrofis or Arthrodia, and Ginglymus. The first is, when a round Head of a Bone is received into a round Cavity of another, such as the Articulation of the Femur with the Ischium; and this fort of Joining is call'd, by Tradefmen, the Ball and Socket.

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Of the Articulation of the Bones.

property of this Joining is, that the Parts o articulated move equally to any fide. The Ginglymus is, when a Bone both receives and is received; and the propery of this fort of Articulation is to admit only of the Motions of Flexion and Extension: It is called by Tradesmen Charnall, and it is commonly used in hinges. Of this Articulation there are hree forts. The first is when the end of a Bone has two Protuberances and one Cavity, and the end of the Bone which s articulated with it, has two Cavities nd one Protuberance, as the Humerus and the Ulna. The second is, when a Bone at one extremity receives another Bone, and at its other extremity is receiv'd by the same Bone, as the Radius and Ulna. The third fort is, when a Bone at one end receives another Bone, and at the other end it is received by a third Bone, as the Vertebre do.

The second fort of Articulation, which is call'd Synchondross, is when the Extremities of two Bones are joined to one another by means of an intervening Cartilage. Thus the Bodies of the Vertebre, and the Extremities of the Ribs and Sternum, are joined together, where, though the Motion of all is manifest, yet that of any two is hardly discernable.

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The Third manner of Articulation call'd Synarthrofis, is of two forts, viv. Sutura, and Gomphosis. The Sutura is when two Bones are mutually indented in one another; the Teeth by which they are indented are of various figures; fometimes they are like the Teeth of Saw; sometimes they are broad at their Extremities, and narrow at their Basis; fometimes the fides of the Teeth are likewife indented, and sometimes there are little Bones between the Teeth which are also indented; these are most fre quently in the Sutura Lambdoidalis, and they ferve as Wedges to keep the Teeth firm. Besides these little Bones, then is ordinarily a viscous Humour which glews the Indentations together, and which perfectly unites them in feveral Old Persons.

This fort of Articulation is call'd by Joiners Dove-tailing, and is used in Drawers, Cabinets, and Boxes. All the Bones of the Cranium and Upper Jaw, as also all the Epiphyses of the Bones, are joined by this fort of Articulation.

in another, as a Pin or Nail is in a piece of Wood, and the Teeth only are articulated this way in their Sockets.

To these we may add a third kind of Synarthrosis, very different from any of

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the former, which is, when a Bone has a long and narrow Channel, which receives a small Process, or the Edge of another Bone; and thus the Vomer is articulated to the Os Sphanoides and Septum Narium. By Tradesmen this manner of Joining is call'd Ploughing, which we may therefore call Σχινδύλησις. These comprehend all the different Joinings of Bones in the Humane Body, and therefore I shall not mention several others which we find in Authors to ne the 1960 have the confirment

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The Extremities of all the Bones that are articulated to one another with a manifest Motion, are bound together by membranous Ligaments which rife from the conjunction of the Epiphysis with the Bone; and passing over the Articulation, are inferted at the same place in the other Bone. Thus they form a Bag which embraces all that part of the Extremities of both Bones which play upon one another, and in this Bag is contained a Mucilage for the easier Motion of the Joint; this Mucilage is separated by some Glands which lie in some Fat on the infide of the Ligaments. Those Bones which are articulated by a Ginglymus have the Ligaments much stronger on their fides than they are either before or behind, that the Protuberances may be be kept to play true in their Cavities; for if they might slip the least to either side, the Bones would be frequently out of Joint.

### SECT. V.

# Of the Bones of the Cranium.

THE Cranium or Skull is made up of feveral pieces, which being joined together, form a confiderable Cavity, which contains the Brain, as in a Box.

The Bigness of the Cranium is proportionate to the bigness of the Brain. In Figure is round, a little depressed on it sides. A round figure being the most capacious, was fittest to contain a great quantity of Brains. And the statuess of its sides help to enlarge the Sight and Hearing.

Each Bone in the Cranium is made up of two Tables or Lamina, between which there is a thin and spongious Substance, made of some bony Fibres which come from each Lamina, call'd in Greek

Diploe, in Latin Meditullium.

In it there are a great number of Veins and Arteries which bring Blood for the Nourishment of the Bones. The Tables are hard and solid, because in them the Fibres of the Bones are close to one ano-

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Of the Bones of the Cranium.

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her. The Diploe is fost, because the bony Fibres are at a greater distance from one nother. By this Contrivance, the Crasium is not only made lighter, but also ess subject to be broken.

The External Lamina is smooth, and overed with the Pericranium. The Interal is likewise smooth; but on it there are several surrows made by the Pulse of the Arteries of the Dura Mater, whilst

he Cranium was foft and yielding.

The Bones of the Cranium are joined Of the Suo one another by four Sutures. The first tura Cos call'd the Coronalis. It reaches trans-ronalis, erfly from one Temple to the other; it Lambdoioins the Os Frontis with the Offa Parieta-dalis, Saia. The fecond is call'd Lambdoidalis, be-gittalis, ause it resembles the Greek Letter (A) mosa. Lambda; it joins the Os Occipits to the Offa Parietalia and Petrofa. The third is tall'd Sagittalis; it begins at the top of the Lambdoidalis, and runs straight to the middle of the Coronalis; it joins the two Offa Parietalia together. The fourth is call'd Sutura Squamofa, because the Parts of these Bones which are joined by this Suture, are, as it were, cut flope-wife,

and lapp'd over one another.

This Suture joins the Semi-circular Circumference of the Offa Temporum to the Os Sphænoides Occipiris, and to the Offa Parietalia. The first three Sutures

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Of the Bones of the Cranium.

were call'd Sutura Vera; and the last Sutura Falsa, because it was supposed to have no Indentations, which is false. t

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Of the Sutura Tranfverfalis. Ethmoidalis and Sphænoidalis.

The Bones of the Cranium are not only joined to one another, but they are also joined to the Bones of the Upper Jaw by three other Sutures. The firstis the Transversalis, it runs across the Face, it passes from the little Angle of the Eye down to the bottom of the Orbit, and up again by the great Angle of the Eye over the Root of the Nose; and so to the little Angle of the other Eye. It joins the Os Frontis to the Bones of the Upper Jaw. The second is the Ethmoidalis, it furrounds the Bone of that Name, and joins it to the Bones which are about it. The third is the Sutura Sphenoidalis, it furrounds the Os Sphanoides, joins it to the Os Occipitis, the Offa Petrofa, and to the Os Frontis.

The Cranium is made of several pieces join'd together by Sutures, that it might be the stronger, and less apt to break, that several Membranes and Vessels which suspend the Dura Mater, and which go to the Pericranium, may pass through the Sutures, and that the Matter of Transpiration may pass through

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Of the Bones of the Skull.

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this Bone has feveral Inequalities, made by the Vessels of the Dura Mater. It has two large dimples made by the anterior Lobes of the Brain. Above the Crista Galli it has a small blind Hole, into which the end of the Sinus Longitudinalis is inserted. From this Hole it has a pretty large Spine which runs up along its middle; instead of this Spine, there is fometimes a Sinus, in which lies the Sinus Longitudinalis, which ought to be obferved carefully by Surgeons in Wounds in this place. This Bone is thicker than the Sinciput Bones, but thinner than the Os Occipitis. In Children it is always divided in its middle by a true Suture.

The second and third are the Bones Ossa Parios of the Sinciput call'd Parietalia; they etalia. are the thinness Bones of the Cranium; they are almost square, somewhat long; they are joined to the Os Frontis by the Sutura Coronalis, to one another in the Crown of the Head by the Sutura Sagittalis, to the Os Occipitis by the Lambdoidalis, and to the Osa Temporum by the Sutura Squamosa. They are smeoth and equal on their outside, but on their inside they have several surrows, made by the Pulse of the Arteries of the Dura Mater. They have each a small Hole near the Sutura Sagittalis, through which there pass some Veins which carry the

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Blood from the Teguments to the Sinus Longitudinalis.

Osla Temporum.

The fifth and fixth are the Offa Temporum, fituated in the lower part of the fides of the Cranium; their upper part, which is thin, confilling only of one Table, is of a circular Figure, and is joined to the Offa Parietalia by the Sutura Squamofa: Their lower part, which is thick, hard and unequal, is joined to the Os Occipitis, and to the Os Sphanoidis; this Part is call'd Os Petrofum; they have each three External Apophyses or Procesfes, and one Internal. The first of the External is the Processis Zygomaticus, which runs forwards and unites with the Process of the Os Mali, making that Bridge call'd the Zygoma, under which lies the Tendon of the Crotaphite Muly cle. The second is the Mamillaris, or Mastoideus; it is short and thick, fituated behind the Meatus Auditorius. The third is the Processus Styliformis, which is long and small; to it the Horns of the 0 Hyoides are tied. The Internal Process is pretty long and big in the Bafis of the Skull, it contains all the Cavities and little Bones of the Ear, which have been already described. The Holes in the Temporal Bones are two Internal, and four External. The first of the Internal, is the Hole through which

which the Auditory Nerve passes; the second is common to it and the Os Occipitis; the Eighth Pair of Nerves, and the Lateral Sinus's pals through it. The first of the External Holes is the Meatus Auditorius Externus. The fecond opens behind the Palate; it is the end of that Passage which comes from the Barrel of the Ear to the Mouth. The third is the Orifice of the Conduit by which the Carotidal Arteries enter the Cranium: And the fourth is behind the Processus Mastoideus; by it passes a Vein which carries the Blood from the External Teguments to the Lateral Sinus's. Sometimes this Hole is wanting; there is another which is between the Processis Mastoidens and the Styliformis, through which the Portio Dura of the Auditory Nerve passes. They have each a Sinus lined with a Cartilage under the Meatus Auditorius, which receives the Condyle

of the lower Jaw. The fixth Bone of the Cranium is the Os Occi-Os Occipitis; it lies in the hinder-part pitis. of the Head; it is almost like a Lozenge with its lower Angle turned inwards; it joins the Offa Parietalia and Petrofa by the Sutura Lambdordalis, and the Os Sphenoides by the Schenoidalis. It is thicker than any of the other Bones of

the Cranium, yet it is very thin where M 2 the

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the Splenius, Complexus and Trapezius are inferred. Externally it is rough; internally it has two Sinus's, in which lie the two Protuberances of the Cerebellum, and two large furrows in which lie the Sinus Lateralis. It has seven Holes ; the first two are common to it and the Offa Petrofa; the Lateral Sinus's, and the Par Vagum, pass through them. The third is the great Hole through which the Medula Spinalis passes. The fourth and fifth are the Holes through which the ninth Pair of Nerves passes. The fixth and feventh are two Holes through which there pass two Veins which bring the Blood from the External Teguments to the Sinus Lateralis; sometimes there is but one, and sometimes none of these two; there are fometimes two more through which the Vertebral Veins pass. This Bone has also two Apophyses, one on each fide of the great Hole; they are lined with a Cartilage, and articulated with the first Vertebra of the Neck. It has also a Protuberance in its middle, from which there goes a small Ligament which is inferted into the first Vertebra of the Neck. It is longer in Beafts than in Men.

Os Sphænoides.

The first of the Bones common to the Skull and Upper Jaw, is the Sphanoides. It is a Bone of a very irregular Figure.

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It is fituated in the middle of the bafis of the Skull. It is joined to all the Bones. of the Cranium by the Sutura Sphanoidalis, except in the middle of its fides, where it is continued to the Offa Petrofa as they were one Bone. On its outfide it has five Apophyses. The first two are broad and thin like a Bat's Wings, they are called Pterigoides; they have each a pretty long Sinus, from which the Muscles called Pterigoidei arise; and at their low-er end they have each a small Hook-like a Process, upon which the Peristaphilinus Externus turns its Tendon. The third and fourth make the Internal and lower part of the Orbit; and the fifth is a little Apophyse like the Crista Galli in its forepart, which is received in a Cavity at the further end of the Vomer. There is also a little small Protuberance in the Middle of this Bone, from which the Muscles of the Uvula arise. On its infide it has four Processes call'd Clinoides, they form a Cavity in the middle of this Bone call'd Cella Turcica, in which lies the Glandula Pituitaria. Betwixt the two Tables of this Bone under the Cella Turcica, there is a Sinus, divided in two in its middle, which opens by two Holes into the Cavity of the Nostrils. In the Os Spheneides there are twelve Holes; by the first and feernd fecond pass the Optick Nerves; by the third and fourth, which are call'd Foramina Lacera, pals the third Pair, fourth Pair, first Branch of the fifth Pair, and the fixth Pair; by the fifth and fixth pass the second Branch of the fifth Pair; by the seventh and eighth pass the third Branch of the same Pair; by the ninth and tenth enter the Arteries of the Dura Mater; and by the eleventh and twelfth enter the Internal Carotidales, and the Intercoftal Nerve goes out. The Canals by which the Carotidales enter, are oblique, the beginning of them is made in the Offa Petrofa, and they open within the Skull in the Sphanoides.

Os Ethnoides. The fecond and last of the common Bones is the Os Ethmoides, situated in the middle of the Basis of the Os Frontis, joined to that Bone and to the Os Sphanoides by the Sutura Ethmoidalis. In its middle it has a small Process call'd Crista Galli, to which the fore-end of the Falx is tied. This Bone is perforated by a number of small Holes, through which the Fibres of the Olfactory Nerve pass, therefore it is also called Os Cribriforme. From its under Side there goes a thin Bone, which divides the Cavity of the Nostrils in two; the lower edge of this Bone is groved with the Vomer. On each Side of this Partition

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it has feveral thin spongious Laminæ, call'd Offa Spongiosa, they are full of little Cells, where they are joined to the Ethmoides. There are two Laminæ, which neither adhere to the Os Ethmoides, nor to the other Laminæ, but only by the Membrane which covers them all. The two External Laminæ, of the Offa Spongiosa, make part of the Orbit at the great Canthus, and they are called Offa Plana, because they are smooth and even.

# SECT. V.

Of the Bones of the Upper Jaw.

THE Bones of the Upper Jaw are two, common to it and the Skull, which have been already described; and eleven Proper; that is, five in each Side, and one in the middle; they are joined to the Bones of the Skull by the three Common Sutures, and joined to one another by a fine but true Suture.

The first of the proper Bones is the Os Mali Os Mali or Zygoma; it is of a triangular Figure. Its upper Side makes the lower and external part of the circumference of the Orbit, where it joins the Os Sphanoides. Its Internal Side joins

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the Os Maxillare. Its External has a long Process, which joining that of the Ossa Temporum, forms the Processus Zygomaticus; it joins the Os Frontis at the little Angle of the Eye. It is Concave within, and it slicks out a little forwards, making the highest part of the Cheek.

Os Maxil-

The Second is the Os Maximum, or Maxillare, because in it all the Teeth of the Upper Jaw are set. It is of a very irregular figure. On its out-fide it joins the Os Mali. Its upper fide makes the lower and internal Part or Circumference of the Orbit. At its great Canthus it joins the Os Unguis and Frontis. The lower fide of the Os Nasi is joined to it. Under the Upper Lip it joins with its fellow of the other fide, and both join'd together make the fore and greatest part of the Roof of the Mouth. It is very thin, and between its two Lamina it has a large Cavity which opens by a fmall Hole into the Nostrils. In its lower end it has fixteen Sinus's or Sockets, in which the Teeth are fet. It has a small Hole call'd Orbiter Externus, in that part of it which makes part of the Orbit, through which the Nerves of the fifth Pair which come from the Teeth, pals. Behind the Dentes Incifivi, where it joins with its fellow, it has another which comes from the Nostrils.

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The Third is the Os Unguis, it is a Os Unlittle thin Bone which lies in the great guis. Angle of the Orbit, it has a Hole in which the Lachrymal Sack lies. I fee no reason why this Bone should be counted a Bone of the Upper Jaw, seeing it lies entirely in the great Angle of the Orbit; there is more reason to count it a Lamina of the Os Spongiosum, as the Os Planum.

The Fourth is the Os Nasi; this is a Os Nasi. thin but solid Bone, which makes the upper part of the Nose; its upper end is joined to the Os Frontis by the Sutura Transversalis: One of its sides joins its fellow, where they are supported by the Septum Narium. Its other side joins the Os Maxillare. Upon its lower end the Cartilages of the Nostrils are fasten'd. Externally it is smooth, but Internally it is rough.

The fifth Bone of the Upper Jaw is the Os Palati Os Palati; it is a small Bone almost square, it makes the posterior part of the Roof of the Mouth. It is joined to that part of the Os Maxillare which makes the fore-part of the Palate. It is also joined to its fellow, and to the Processis Pterigoidaus. It has a small Hole thro' which a branch of the fifth Pair of Nerves goes

to the Membrane of the Palate.

Vomer.

The Eleventh and last is call'd the Vomer, it is situated in the middle of the lower part of the Nose. It has a cless in its upper Side, in which cless it receives the lower edge of the Septum Nass. In its further end it receives a small Apophyse of the Os Sphanoides, and its under Side joins the Os Palati.

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By what has been said, you see, that the Bones of the Skull and Upper Jaw compose the Orbit of the Eye. The upper part of it is made of the Os Frontis; the Os Unguis and Os Planum make the inner and lower part of the great Angle; and the Os Sphanoides the inner and lower of the little Angle. The Os Maxillare makes the inner and lower part of the Circumference, and the Os Mali the out-

er and lower part.

Let us now briefly recapitulate all the Holes in the Head. They are either External or Internal. The External Holes are, 1. The two in the Coronal Bone above the Orbit, through which a Vein, Artery and a Nerve from the Ophthalmick Branch of the fifth Pair pass, for the Brow and frontal Muscles; this frequently appears only as a Notch.

2. The Orbiter Internus in the same Bone within the Orbit, a little above the Os Planum, for another Branch of the fifth Pair of Nerves which goes to

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the Nofe. 3. Is between the Os Ungun and the Os Maxillare, in the great Canthus, through which the Ductus Lachrymalis passes to the Nose. 4. Orbiter Externus in the Os Maxillare below the Orbit through which the Nerves and Veffels which come from the Teeth pass to the Cheek. 5. One fingle Hole in the fame Bone behind the fore-Teeth, which comes from the Nose. 6. Two in the Offa Palati, through which a Branch of the fifth Pair of Nerves passes to the Palate, Uvula and Gums. 7. In the Temporal Bone between the Processis Mastoideus and Styliformis, through which the Portio Dura of the Auditory Nerve passes. 8. The Dustin Auditorius Externus. 9. The Dustus Auditorius Internus. 10. The Conduit for the Carotidal Artery. 11. In the fame Bone through which a Vein padles from the External Teguments to the Lateral Sinus's; this is behind the Processis Mastoideus. 12. In the Occipital Bone behind its Apophyses, thro' which the Vertebral Veins pals. 13. In the same Bone for a Branch of the External Jugular. 14. One fingle large Hole for the Medulla Spinalis.

The Internal Holes are, r. The blind Hole above the Christa Galli. 2. The Holes in the Os E hmoides. 3. In the Os Sphenoides for the Optick Nerves. 4. The

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Foramen Lacerum, through which the third, fourth, first branch of the fifth and fixth Pair of Nerves pass. 5. For the second Branch of the fifth pair of Nerves. 6. For the third Branch of the same Nerve. 7. The Foramen Arterie dura Matris. 8. The Canal through which the Carotidale enters, and the Intercostal passes out, but this we counted among the External holes. 9. In the Process of the Os Temporum through which the Auditory Nerve paffes. 10. Between the Temporal and Occipital Bones, it is divided in two by the Dura Mater, through the one Part passes the eighth Pair of Nerves and the Nervus Accessorius; through the other, the Lateral Sinus's open into the Internal Jugulars. 11. One in each fide of the large Hole of the Occiont, thro' which the ninth Pair of Nerves goes out.

# SECT. VI.

Of the Lower Jaw.

THE Lower Jaw is made of one Bone whose Fibres at the Chin, in Children, do not offisse till they are about two Years old. It is composed of two Tables, which are pretty hard and smooth; but

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but betwixt these two Lamine it is porous and full of little Cavities; its figure resembles the Letter v; at each Extremity it has two Processes; the uppermost is call'd Corone; it is thin and broad at its beginning, but it ends in a sharp Point, which passing under the Processus Zygomaticus, has the Tendon of the Crotaphite Muscle inserted into it. The other which is shorter and lower, has a round Head, lin'd with a Cartilage, which is articulated into the Sinus of the Os Petrofum; but betwixt the Cartilage which lines the Sinus, and that which covers the Head of this Process there is a third, which adheres to the Ligamentum Annulare which furrounds this Articulation. The Motion of the Jaw fideways, which is absolutely necessary in chewing, is much facilitated by this loofe intervening Cartilage. The lower Edge of this Jaw is call'd its basis, each end of which is call'd the Angle of the Lower Taw.

The Lower Jaw has four Holes, two on its infide near its Processes, and two on its outside near its middle. By the Internal Holes enter a branch of the fifth Pair of Nerves, an Artery from the Carotidales, a Vein passes out to the Jugulars, their branches are spread in the roots of the Teeth. By the External Holes these same Vessels pass, and are distributed up-

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### Of the Teeth.

on the Chin. It has also fixteen Sinus's into which the Teeth are set.

# SECT. VII.

# Of the Teeth,

Of the Substance of the Teeth. THE Teeth are the hardest and smoothest Bones of the Body; they are formed in the Cavities of the Jaws, which are lined with a thin Membrane, upon which there are several Vessels, through which there passes a thick, viscous transparent Humour, which as it encreases, hardens in the form of Teeth, which about the seventh or eighth Month after Birth, begin to pierce the edge of the Jaw, tear the Periosteum and Gums, which being very sensible, create a violent Pain and other Symptoms incident to Children in the Time of Toothing.

The Teeth begin not to appear all at one Time; First the Dentes Incisivi of the Upper, and then those of the Lower Jaw appear, because they are the thinness and sharpest. After them come out the Canini, because they are sharper than the Molares, but thicker than the Incisivi, and last of all the Molares, because they are the thickest and bluntest. Of this

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viscous transparent Liquor, which is the Substance of the Teeth, there are two Lays, the one below the other divided by the same Membrane, which covers all the Cavity of the Jaw : The uppermost Lay forms the Teeth which come out first, but about the seventh Year of Age they are thrust out by the Teeth made of the undermost Lay, which then begin to sprout; and if these Teeth be lost, they never grow again; but if some have been observed to shed their Teeth twice, they have had three Lays of this viscous Humour. About the One and twentieth Year the two last of the Molares spring up, and they are call'd Dentes Sapientia.

The Teeth, which are fometimes of the fourteen, sometimes fifteen, and some-Dentes Intimes fixteen in each Jaw, are of three cifivi. forts, the Dentes Incifivi, Canini, and

The Incifivi are the four fore-Molares. most Teeth in each Jaw, they are pretty broad, sharp at their ends, a little convex outwards and hollow inwards; they have each a pretty long Root, which is a little crooked, and which grows small towards its Extremity, that the pressure might not be all directly upon one point of the Jaw, but sustained equally by every part which the Sides of the Root touch.

The

256 Canini.

The Canini are two in each Jaw, one on each fide of the Incifivi; they are pretty thick and round, and they end in a sharp Point; they have each one Root, which is longer than the Roots of the Incifivi; their proper Use is to pierce the Aliments, because the Fore-Teeth are not only apt to be pulled outwards by the things we hold and break with them, but likewise because they are more subject to blows than the Molares. therefore above two thirds of them are contain'd in their Alveoli or Sockets, by which their refistance of all lateral preffures is much greater than that of the Molares.

Molares.

The Molares ordinarily are ten in each Taw; they are the thickest and biggest of the Teeth, their Extremities are broad and uneven; and because the pressure upon them is generally perpendicular, therefore they have fornetimes two, fometimes three, and fometimes four Roots, which separate a little from one another, that having a broad Bafis, they may find the greater refistance from the Jaw when they press upon one another in chewing of the Aliments; and the pressure has the less force, seeing the Roots are a little crooked outwards, and not in a streight Line under the pressure. The last of the Molares are the

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the biggest and hardest, because we ordinarily thrust the hardest Bodies farthest into our Mouth; they are nigheft the Articulation, because their Use, which is to grind the Aliments small, requires the greatest strength. The Roots of the Teeth of the Upper Taw are all fomewhat larger than those of the Under Jaw, because the Upper Taw is not fo strong to refist the preflure of the Teeth as the Lower is.

#### SECT. VIII.

Of the Spine and Vertebræ.

BY the Spine, we understand that The Numchain of Bones which reaches from ber of the the first Vertebra of the Neck to the Os Vertebræ. Coccygis; they are twenty four in number, besides those of the Os Sacrum, feven Vertebra of the Neck, twelve of the Back, and five of the Loins; they lie not in a straight Line, for those of the Neck bend inwards, those of the Back outwards, for enlarging the Cavity of the Thorax; those of the Loins bend inwards again, and those of the Os Sacrum outwards, to enlarge the Cavity of the Bason.

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tebræ.

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In each Vertebra we distinguish two he S of the Ver-Parts, the Body of the Vertebra, and its Processes; the Body is foster and more fpongious than the Processes, which are harder and more folid. The forepart of he the Body is Round and Convex, the Verte hindpart fomewhat Concave; its upper and lower Sides are plain, each coverd mot with a Cartilage which is pretty thick tend forwards, but thin backwards, by which peri means we bend our Body forwards; for have the Cartilages yield to the pressure of the who Bodies of the Vertebra, which in that Motion come closer to one another This could not be effected, if the harder Bodies of the Vertebra were close to one another. Each Vertebra has three forts of Processes towards its hinder part, two transverse or lateral, one on each Side; they are nearer the Bodyof the Vertebra than the rest. In each of them there is a Tendon of the Vertebral Muscles inserted. Four Oblique Processes, two on the upper part, and two on the lower, by these Vertebre are articulated to one another; and one Acute on the hindmost part of the Vertebra.

These Processes with the hinder or concave part of the Body of the Vertebræ, form a large Hole in each Vertebra, and all the Holes answering one another, make a Channel for the descent of

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1 two he Spinal Marrow, which fends out its Verves to the feveral Parts of the Body y Pairs, through two small Holes formd by the jointing of four Notches in he Sides of each Superior and Inferior Vertebra. Was Diversito and ello

The Vertebra are articulated to one Of the Arnother by a Ginglymus; for the two def-ticulation ending Oblique Processes of each Su of the Verperior Vertebra of the Neck and Back, tebra. have a little dimple in their Extremities, wherein they receive the Extremities of he two ascending Oblique Processes of the Inferior Vertebræ; so that the two feending Processes of each Vertebra of the Neck and Back are received, and the wo descending do receive, except the first of the Neck, and last of the Back; but the ascending Processes of each Versebra of the Loins receive, and the two descending are received contrary to those

The Vertebra are all tied together by a hard Membrane made of strong and large Fibres: It covers the Body of all the Pertebra forwards, reaching from the first of the Neck to the Os Sacram: There is another Membrane which lines the Canal, made by the large Hole of each Vertebra, which also ties them all together. Befides, the Bodies of each Vertebra are tied to one another by the

of the Neck and Back.

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intervening Cartilages and the Tendons of the Muscles, which are inserted in their Processes, tie them together be-

hind.

This Structure of the Spine is the very best that can be contrived; for had it been all one Bone, we could have had no motion in our Backs; had it been of two or three Bones articulated for motion, the Medulla Spinalis must have been necessarily bruised at every Angle or Joint; befides, the whole would not have been so pliable for the several postures we have occasion to put our selves in. If it had been made of several Bones without intervening Cartilages, we should have had no more Use of it, than if it had been but one Bone. If each Vertebra had had its own distinct Cartilages, it might have been easily dislocated. And laftly, the oblique Processes of each Superior and Inferior Vertebra keep the middle one that it can neither be thrust backwards nor forwards to compress the Medulla Spinalis.

Thus much of the Vertebræ in general; but because they are not all alike, we shall therefore descend to a more par-

ticular Examination.

The feven Vertebræ of the Neck differ from the rest in this, that they are smaller and harder. Secondly, That their tranf-

Of the Vertebræ of the Neck.

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ransverse Processes are perforated for the Passage of the Vertebral Vessels. Thirdy, That their acute Processes are forked and straight; but besides this, the first and second have something peculiar to hemselves.

The first, which is call'd Atlas, is Atlas. ied to the Head, and moves with it pon the second semi-circularly; its scending Oblique Processes receive the Tubercles of the Occiput, upon which Articulation the Head is only moved forwards and backwards; and its descendngProcesses receive the ascending Proesses of the second Vertebra. It has no cute Process, that it might not hurt the ction of the Musculi Rett; but a small Tubercle to which the small Ligament of he Head is inferted. In the forepart of ts great Hole it has a pretty large Sinus, n which lies the Tooth-like Process of the fecond Vertebra, being fasten'd by a Ligament that rises from each side of the Sinus, that it compress not the Medulla It has two fmall Sinus's in its Spinalis. upper part, in which the tenth Pair of Nerves and the Vertebral Arteries lie.

The Second is call'd Epistrophaus, or Epistro-Vertebra Dentata, in the middle between phaus. its two oblique ascending Processes, it has a long and round Process like a Tooth, which is received into the fore-

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faid Sinus; upon it the Head with the Mu first Vertebra turns half round as upona Axis. The Extremity of this Proce is knit to the Occiput by a small bu flrong Ligament. A Luxation of this Tooth is mortal, because it compresse the Medulla Spinalis.

Axis.

The third Vertebra is called Axis; and the four following have no Name, no

Of the of the Back.

any peculiar Difference. The twelve Vertebræ of the Back di Vertebræ fer from the rest in this, that they ar larger than those of the Neck, and smal ler than those of the Loins; their acun Processes slope downwards upon one; nother: They have in each Side of their Bodies a small Dimple wherein they re ceive the round Extremities of the Ribs, and another in their transverse Processes which receives the little Tubercle near that Extremity of the Ribs. The Articulation of the twelfth with the first of the Loins is by Arthrodia, for both its ascending and descending oblique Processes are received.

Of the Vertebræ of the Loins.

The five Vertebra of the Loins differ from the rest in this, that they are the broadest, and the last of them is the largest of all the Vertebra. Their acute Processes are broader, shorter, and wider from one another, their transverse longer, to support the Bowels, and the Muscles preffe

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ith the Muscles of the Back; they are not perupona forated as those of the Neck, nor have Proce they a Dimple or Sinus as those of the all by Back. The Cartilages which are beof this wixt their Bodies are thicker than any of the rest.

> The Vertebræ of the Os Sacrum grow Of the Os fo close together in Adults, as that they Sacrum.

make but one large and folid Bone of the Figure of an Isosceles triangle, whose Basis is tied to the last Vertebra of the Loins, and the upper part of its fides to the Ilia, and its Point to the Os Caccigis. It is Concave and smooth on its forefide, but Convex and unequal on its backfide. It hath five Holes on each Side, but the Nerves pass only through the five on its forefide. Its acute Processes or Spines are shorter and less than those of the Loins, and the lower is always shorter than the upper.

The Os Coccigis is joined to the Ex-Os Coccitremity of the Os Sacrum; it is composed gis. of three or four Bones, of which the lower is fill less than the upper, till the last ends in a small Cartilage; it resembles a little Tail turn'd inwards; its Use is to fultain the straight Gut; it yields to the Pressure of the Fætus in Women in Travail, and Midwives use to thrust it backwards, but fometimes rudely and

violently, which is the occasion of green to Pain, and of several bad Effects.

From what has been faid, it is east ba to understand how the Motion of the Back is performed: Though each part the cular Vertebra has but a very small Mo the tion, yet the Motion of all is very con a fiderable. We have faid, that the Hearth moves only backwards and forwards up we on the first Vertebra, and semi-circularly the upon the second. The small Protube is rance which we have remarked in the output of the seminant of the Bone of the hind Head, falling upon another in the first Vertebra, stops the h Motion of the Head backwards, that is compress not the Spinal Marrow; and even when the Chin touches the Sternum hit can move no farther forwards. The is Oblique or Semi-circular Motions and Blimited by the Ligament which ties the Process of the second Vertebra to the Head, and by those which tie the first let to the second Vertebra. The Motion of the other Vertebræ of the Neck is not so manifest; yet it is greater than that of the Vertebræ of the Back, because their il acute Processes are short and straight, and the Cartilages which are between their Bodies thicker. The twelve Vertebra we of the Back have the least Motion of any, w because their Cartilages are thin, their Veracute Processes are long, and very near in

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of gree to one another; and they are fixed to the Ribs, which neither move forwards nor is east backwards. But the greatest Motion of of the the Back is performed by the Vertebra of h particle Loins, because their Cartilages are all Mo thicker, and their acute Processes are at ry con a greater distance from one another; for the Heathethicker the Cartilages are, the more rds up we may bend our Body forwards; and cularly the greater Distance there is betwixt the rotube cute Processes, the more we may bend in the our selves backward.

g upon This is the Structure and Motion of ps the he Vertebræ, when they are in their nathat i ural Position; but we find them also in everal Persons several ways distorted. If the vertebræ of the Back slick out, such The s have this Deformity are faid to be ons an Bunch-back'd; and in fuch the Cartilato the ery thin and hard forwards, but confi-he first lerably thick backwards, where the ob-tion of ique Processes of the Superiour and In-not so eriour Vertebræ are at a considerable dithat of fance from one another, which distance their ills up with a viscous Substance. This ht, and nequality of the thickness of the Cartitheir ages happens either by a Relaxation or veakness of the Ligaments and Muscles, of any, which are fasten'd to the back side of the Vertebræ, in which Case their Antagonists inding no opposition, remain in a conti-

nual Contraction, and confequently the can be no Motion in these Vertebra. this Deformity has been from the Wom then the Bones being at that time foft an tender, the Bodies of the Vertebrae pa take of the fame inequality as the Car tilages. If the Bunch be towards of Shoulder, for example, towards the right, then the Cartilages on that fideat very thick, but thin and dry on the other iı fide; on the left fide the Oblique A physes come close together, but on the right there is a confiderable distance b twixt them; and the Ligaments and Muscles are greatly extended on the right fide, but those on the left are as much contracted. If the Vertebræ are difforte inwards, all things have a different face The Cartilages, and sometimes the Ven bre are very thick forwards, but might thin and hard backwards: The acute at oblique Processes are very close to es another, and the Ligaments upon the Bodies of the Vertebra are greatly relax ed, but the Muscles and Ligaments which tie the Processes together are very mud contracted. These Distortions selder happen in the Vertebra of the Loins but fuch as are fo miserable, have little or no Motion of their Back.

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THE Offa Innominata are two large Bones fituated on the fides of the Os Sacrum; in a Fætus they may be each feparated into three pieces, which in Adults unite and make but one Rone, in which they diffinguish three Parts. The first and superior Part is call'd Os Ilium; the Intestine Ilium lieth between it, and its fellow. It is very large, almost of a femi-circular Figure, a little Convex and uneven on its External fide, which is call'd its Dorsum, and Concave and smooth on its Internal fide, which is call'd its Costa. Its Circumference or Edge is call'd its Spine. It is joined to the fides of the three Superior Vertebræ of the Os Sacrum by a true Suture: It is larger in Women than in Men.

The second is the Os Pubis, which is Os Pubis. the inferior and forepart of the Os Innominatum; 'tis united to its fellow of the other fide by an intervening Cartilage, by which means it makes the fore part of the Pelvis or Bason, of which the Os Sacrum is the back part, and the

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The third is the Inferiour and Poste. riour, called Ischum or Coxendix; it has a large Cavity called Acetabulum Coxendicis, which receives the Head of the Thigh-Bone; the Circumference of this Cavity is tipt with a Cartilage call'd its Supercilium, where it joins the Os Pubis: it has a large Hole called Foramen Ischi & Pubis, about the Circumference of which the Muscles call'd Obturator Internus and Externus arise. And at its lower end it has a large Protuberance upon which we fit, and from whence the Benders of the Leg arise. And a little above this, upon its hinder part, it has another fmall acute Process, betwixt which and the former Protuberance lies the Sinus of the Ischium, through which the Tendon of the Obturator Internal paffes.

#### SECT. X.

Of the Ribs.

Coffx.

THERE are Four and twenty Ribs, twelve on each fide of the twelve Vertebre of the Back; they are crooked, and like to the Segments of Circles; they grow flat and broad as they approach the Sternum, but the nearer they are to the

the Vertebræ they are the rounder and Poste. hicker, at which end they have a round it has Head, which being cover'd with a Car-Coxentilage, is received into the Sinus in the of the Bodies of the Vertebræ; and at the Neck of this of each Head (except the two last Ribs) ll'd its there is a small Tubercle, which is also Pubis: received into the Sinus of the transverse n Ischi Processes of the same Vertebra. The nce of Ribs thus articulated, make an acute tor In-Angle with the Lower Vertebra. at its The Ribs have each a small Canal or erance ace the Little

Sinus, which runs along their under Sides, in which lies a Nerve, Vein, and Artery, Their Extremities, which are fastned to the Sternum, are Cartilaginous, and the Cartilages make an obtuse Angle with the bony part of the Rib; this Angle respects the Head. The Cartilages are harder in Women than in Men, that they may the better bear the

Weight of their Breafts.

The Ribsare of two forts; the feven upper are call'd Cofte Vera, because their Cartilaginous Ends are received into the Sinus of the Sternum. The five lower are call'd Falfa, because they are shorter and fofter, of which only the first is joined to the Extremity of the Sternum, the Cartilaginous Extremities of the rest are tied to one another, thereby leaving greater space for the Dilatation of the Stomach 100015

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and Entrails. The last of these salse Ribs is shorter than all the rest; It is not tied to them, but sometimes to the Midriss, and sometimes to the Misseulus Obliquis

Descendens.

If the Ribs had been articulated with the Bodies of the Vertebræ at right Angles, the Cavity of the Thorax could never have been enlarg'd in breathing; If each Rib had been a rigid Bone articulated at both ends to two fix'd points, the whole Chest had been immoveable. If the Ribs had not been articulated to the Transverse Processes of the Kene bra, the Sternum could not have been thrust out to that degree it is now, or the Cavity of the Thorax could not have encreased so much as is requisite in Inspiration. For when the Ribs are pulled up by the Intercostal Muscles, the Angle which the Cartilages at the Sternum make with the bony part of the Rib must be encreafed, and confequently its Subtenfe, or the distance between the Sternum and the Transverse Processes, lengthned Now, because the Rib cannot move beyond the Transverse Process, upon the account of its Arriculation with it; therefore the Sternam must either be thrust to the other fide, or elfe outwards. It cannot move to the other fide, because of an equal preffure upon the fame account DOE

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count there, and therefore it is thrust outwards, or the distance between the Sternum and the Vertebre, is encreased. The last Ribs, which do not reach the Sternum, and confequently conduce nothing in this Action, are not arriculated

with the Transverse Processes.

If we suppose the Cavity of the Thorax to be half a Sphæroide, whole Semi-Axis is the height of the Thorax, or I s Inches, and the Diameter of its greatest Circle 12 Inches, then the Cavity of the Thorax contains 1130 Cubick Inches. But in an easie Inspiration the Sternum is raised of an Inch (as I am affured by an exact Experiment) upon which account the Cavity of the Thorax is encreased to 1150 Cubick Inches. To this if we add the space the Diaphragma leaves, which is the Segment of a Sphere, whose Diameter is 15 Inches, and the Solidity of the Segment 183 Inches, we shall have 22 Inches more, if the Diaphragma descends but one Inch; but if it descends an Inch and an half, it leaves room for 52 Inches of Air to enter; and if it descends 2 Inches, the Cavity of the Thorax will be encreased upon the account of the Motion of the Diaphragma alone 86 Inches. So that in the least Inspiration we can fairly suppose, the Lungs are distended with 42 No. Inches Of the Breaft-Bone.

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Inches of Air, and they may be some times with above 70 or 100.

### SECT. XI.

Of the Breast-Bone.

Sternum.

THE Sternum or Breaft-Bone is fituated in the middle of the Breaft; it is composed of seven or eight Bones in Infants, which at first are Cartilaginous, but which harden and unite into three Bones after they are seven Years Old: The Substance of these Bones is not solid, but somewhat spongious.

The first and uppermost Bone is the biggest and largest; it is uneven and rough on its outside, but smoother on its inside where it has a shallow Furrow which gives way for the descent of the Wind-Pipe. It has a Sinus lined with a Cartilage on each Side of its upper end, wherein it receives the Heads of the Clavicula.

The second is longer and narrower than the first, and on its fides there are several Sinus's, in which the Cartilaginous Ends of the Ribs are received.

The third is shorter, but broader than the second; it receives into the Lateral Sinus's the Extremities of the last true Ribs; Of the Glaviculæ and Scapulæ,

Ribs; it terminates into a Cartilage which hardens sometimes into a Bone, call'd Cartilago Xiphoides, or Ensiformis, because it is broad at its upper end, where it joins the third Bone, and grows narrower to its Extremity, where it is sometimes forked, and fometimes it bends inwards, compresses the upper Orifice of the Stomach, and causes a great Pain and Vomiting.

The use of the Sternum is to defend the Heart, and to receive the Extremi-

ties of the true Ribs.

# SECT. XII.

Of the Claviculæ and Scapulæ.

THE Clavicula or Channel-Bones are Clavicula two in Number, situated at the Basis of the Neck, above the Breast, one on each fide; they are pretty long and fmall; at one end they are joined to the Production of the Scapula, call'd Acromion, by the Articulation call'd Synchondrofis; at the other end, to the upper end of the Sternum by the Articulation called Arthrodia; they are crooked like an Italian (1) for the Passage of the Vesfels which pals under them, and to facilitate the Motion of the Arms.

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Their Substance is Spongious, there fore they are the more easily broken, and the sooner united when broken: Then Use is to sustain the Scapulæ to which the Arms are articulated. And because the Pectoral Muscle which pulls the Arms cross the Breast, is inserted near the upper end of the Humerons Bone; therefore if the Clavicula did not keep the Scapula to which the Head of the Humerons is joined always at an equal distance from the Sterkum, the upper part of the Arm and not the Hand, must have been pulled forwards.

Scapulæ.

The Scapula, Oponxara, or Shoulder blades, are two large and broad Bones like the Triangle call'd Scalenum; they are fituated on each fide of the upper and back part of the Thorax. The Substance of the Scapula is thin, but folid and firm; its out-fide is somewhat Convex, and its infide Concave; its upper edge is call'd Cofta Superior, and its lower Costa Inferior; its broad end is call'd its Basis, which, with the two edges, make the upper and lower Angles. They have each three Processes, of which the first runs all along the middle of their outfide, and 'tis called their Spine. That end of the Spine, which receives the Extremity of the Clavicula is call'd Acromion. The fecond Proces

# Of the Bones of the Arm, &c.

Process is a little lower than the Acromion; 'tis short and sharp like a Crow's
Bill, therefore call'd Coracoides; these
two Processes are tied to one another
by a strong Ligament which serves to
keep the Head of the Humerus in the
Cavity of the third Process, which is
call'd Cervix. This Process, is the Extremity of the Scapula, which is opposite to its Basis. It has a round Sinus,
tipt about its brim with a Cartilage
which receives the Head of the Humerus.

The Use of the Scapula is to receive the Extremities of the Clavicula and Humerus, for the easier motion of the Arm, and to give a rise to the Muscles

which move the Arm.

# SECT. XIII.

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Of the Bones of the Arm and Head.

THE first Bone of the Arm is the Tie HuHumens, or Shoulder-Bone; 'tis merus.
long and round. Its Substance or Fibres
are pretty solid and compast; it has a
pretty wide and long Cavity in its middle, in which is contained its Marrow.
At its upper end it has a round Head
cover'd with a Cartilage, which is teceived

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f the econd rocele ceived into the Cavity of the Neck of . fm the Scapula. In the forepart of the Head there is a Channel in which a Tendon of the Biceps lies; but because this Head is much larger than the Cavity, therefore there is a firong Ligament which rifes from the edge of the Cavity of the Scapula, and forming a Bag round the Head of the Humerus, is inserted between the Epiphysis and the Bone. Thus the Articulation of the Humerus with the Scapula, is an Arthrodia or Ball and Socket, that the Arm might have all manner of Motions. But the greateft part of the Socket is made of a Ligament : For though the Joint would have been stronger if the Cavity had been all of Bone; yet the Neck of the Humerus being large and strong, the Compals of the Arm must have been very small. The lower end of the Humerus, which is thinner and broader than the other, has two Protuberances. The External is received into the Extremity of the Radius; from the Internal the Muscles which bend the Fingers and Hand rife, and between these two Protuberances there are two small semicircular Rifings, with a middle Channel, by which the Humerus is joined to the Ulna by a Ginglymus. On the forefide of these Protuberances there is

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t 5 ck of small Sinus which receives the fore Prothe es of the Ulna; and on the backfide ch a here is another large Sinus which recause eives the Olecranum.

Cavi- The Ulna or Cubitus is a long and hard Ulna. ment Bone with a Cavity in its middle, it avity lies on the infide of the fore Arm, ound reaching from the Elbow to the Wrist; erted it is big at its upper end, and grows Bone. maller to its lower end. At its upper merus t has two Processes which are received Ball into the fore and hind Sinus's of the have Extremity of the Humerus: The forereat- nost process is finall and short; the hindmost, call'd 'Oxéngaror, is bigger ould and longer; it flays the fore Arm when t comes to a straight Line with the Arm. Betwixt these Processes it has a Semicircular Sinus, which receives the inner Protuberance of the lower end of the Humerus, upon which we bend and extend our fore Arm. And along the middle of that there runs a small ridge by which this Bone is articulated to the Humerus by Ginglymus. Had the Articulation here been an Arthrodia, the Joint must have been much weaker, but the Hand could have received no more Motion from it than it has now from the Shoulder.

The infide of this upper end has a fmall Sinus which receives the Circum-

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ference of the round Head of the Radius. Its lower Extremity, which is round and small, is received into a Sinu in the lower end of the Radius, and upon this Extremity it has a short and small Process, from which the Ligaments which tie it to the Bones of the Wrist arise; this Process serves to keep the Bones of the Wrist in their place.

Radius.

The Radius is another Bone of the fore-Arm, which accompanies the Ulia from the Elbow to the Wrist; in in upper end it has a small Cavity which receives the outer Protuberance of the Humerus. The Circumference of this Cavity rouls in the small Sinus in the upper end of the Ulna. Near its lower end which is bigger than its upper, it has a little Sinus which receives the end of the Ulna, and in its Extremity it has two Sinus's which receive the Bones of the Wrift. Although the Ulna and the Radius accompany one another, yet they touch not but at their Extre mities. They bend from one another in their middle, but they are tied together by a firong and broad membranous Ligament.

The upper end of the Ulna is the biggest, because upon it, and not upon the Radius, the Articulation at the Elbow is performed; but the lower

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Of the Bones of the Arm, &c.

end of the Radius is biggest, because upon it only the Hand is articulated. The Radius moves either backwards or forwards upon the Ulna, by which means the Palm of the Hand is turned either upwards or downwards, which two Motions are called Pronation and Supination. Nor could any other Articulation have given these two Motions to the Hand; for though an Arthrodia admits of a Motion to every side, yet we cannot by that turn the forepart of our Arm backwards; and how useless our Hands had been without these Motions, every one may easily perceive.

The Carpus or Wrist is made up of Of the eight little Bones of a different Figure Bones of and Bigness; they are placed in two the Car-Ranks, four in each Rank. The first Puss. Rank is articulated with the Radius. The second with the Bones of the Metacarpus. The last little Bone of the first Rank lies not at the side of the third, which answers to the Bone of the Metacarpus of the little Finger, as all the rest do by one another, but it lies upon it; they are strongly tied together by the Ligaments which come

from the Radius: and by the Annulary

Ligament, through which the Tendons

which move the Fingers pass. Although

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acarpus.

The Metacarpus is made up of four of the Me-Bones which answer the four Fingers; that which fullains the Fore-Finger is the biggest and longest; they are round and long, a little Convex and round to wards the back of the Hand, and Concave and plain towards the Palm. They are hollow in the middle and full of Marrow; they touch one another only at their Extremities, leaving Spaces in their middle, in which lie the Musculi Interossei. In their upper end there isa Sinus which receives the Bones of the Wrist, and their lower Extremity is round, and is received into the Sinus of the first Bones of the Fingers.

The Bones of the Fingers.

The Bones of the Fingers and Thumb are fifteen in each Hand, three to each Finger; they are a little Convex and round towards the back of the Hand, but hollow and plain towards the Palm, except the last where the Nails are. The order of their Disposition is call'd First, Second, and Third Phalanx. The First is longer than the Second, and the Second than the Third. The Upper Extremity of the First Bone of each Finger has a little Sinus which receives the round Head of the Bones of the Metacarpus. The upper Extremity of the

Of the Bones of the Arm, &c.

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he Second and Third Bones of each Finer hath two small Sinus's parted by a ittle Protuberance; and the lower Exremity of the first and second Bones of ach Finger has two Protuberances, diided by a small Sinus. The two Protuerances are received into the two Sius's of the upper Extremity of the seond and third Bones; and the small Sius receives the little Protuberance of he same end of these same Bones. The rst Bone of the Thumb is like to the Bones of the Metacarpus, and it is joind to the Wrist and second of the Thumb, as they are to the Wrist nd first of the Fingers. The fecond Bone of the Thumb is like the first Bones of the Fingers, and it is joined o the first and third, as they are to the Bones of the Metacarpus, and second of he Fingers. The Fingers are moved ideways only upon their first Joint.

Besides these Bones, there are some Ossa Sesasmall ones called Ossa Sesamoidea, be-moidea. cause they resemble the Grains of Sesanum, they are reckon'd about twelve in each Hand; they are placed at the Joints of the Fingers, under the Tendons of the Flexores Degitorum, to which they

ferve as fo many Pulleys.

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# SECT. XIV.

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Of the Bones of the Thighs, Legs and Feet.

THE Thigh has only one Bone, which is the longest of all the Bones of the Body; its Fibres are close and hard; it has a Cavity in its middle; 'tis a little Convex and round on its foreside, but little hollow, with a long and small little hollow.

The first is its Extremity, which is: large and round Head covered with Cartilage, which is received into the Acetabulum Coxendicis, wherein it tied by two Ligaments. The first pretty large, and comes from the edger the Acetabulum. The second is round and fliort, it comes from the bottom of the Acetabulum, and is inferted into the middle of the round Head: The Par immediately below this round Head which is small, long, and a little oblique is called its Neck. It makes an Angl with the Body of the Bone, by which means the Thighs and Feet are kept a distance from one another, and w Hand

Of the Bones of the Thighs, &c.

nd firmer, the Linea Propensionis easily ling Perpendicular upon any part of e quadrangular space between the Feet, and essel, this obliquity of the Neck of eBone it conduces much to the firength the Muscles of the Thigh, which must ve otherwise pass'd very near to the

> enter of Motion. The second is call'd Trochanter Major : Trochanis a pretty big Protuberance on the Ex-ter Major. rnal fide of the Thigh-Bone, just at e Root of the Neck; it is rough, be-

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use of the Insertion of some Muscles init. It has a fmall dent at its root, into hich the Musculi Quadragemini and the

turatores are inserted.

The third is call'd Trochanter Minor ; Trochanis on the hindfide of the Thigh-Bone, ter Minor. little lower and less than the other.

hele Protuberances encrease mightily e force of the Muscles, by removing not nly their Infertions, but likewife the

irections from the Center of Motion. The lower Extremity of the Thighone, which is articulated with the ibia by Ginglymus, is divided in the iddle by a Sinus into two Heads or rotuberances; the External and the nternal, which are received into the pper Sinus's of the Tibia. Through he space that is between the hind-parts f these two Heads pass the great Vel-

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Of the Bones of the Thighs, &c. fels and Nerve which go to the Leg; be cause the upper end of the Thigh-Bon was articulated by an Arthrodia, that w might not only move our Legs back wards or forwards, but likewise near to, or farther from one another; then fore its lower Extremity was joined the Tibia by Ginglymus, which is the

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ftrongest Articulation. Patella.

In the Knee there is a little roun Bone about two Inches broad, prett thick, a little Convex on both fide covered with a fmooth Cartilage on it foreside; it is soft in Children, but ver hard in those of riper Years; it is called Mola, Patella, or Pan; over it pass the Tendons of the Muscles which exten the Leg, to which it ferves as a Pulle of for facilitating their Motion, by removing ving their Direction from the Centre Motion.

Tibia.

In the Leg there are two Bones, the inner and bigger is called Tibia, or Foril Majus; 'ris hard and firm, with a Ca vity in its middle; 'tis almost triangu the Shin. In its upper Extremity it has y two large Sinus's tipt with a foft and fupple Cartilage call'd Cartilago Lunan from its Figure. It was in the from its Figure: It runs in between the Extremities of the two Bones, and be comes very thin at its edge. Like thole

Of the Bones of the Thighs, &c.

the Articulation of the Lower Jaw, facilitates a small fide Motion in the nee. The Sinus's receive the two Proberances of the Thigh-Bone, and the roduction which is between the Sinus's the Tibia is received in the Sinus which vides these two Protuberances of the mur. By bending our Knee, we bring ar Leg in walking in a straight Line, rwards, which without this Articulaprett on we could not have done, but, like h fide sofe who have the Misfortune to have e on it Wooden Leg, we must have brought out ver ur Foot about in a Semi-circle in going is called ven upon a Plain, but more evidently pass the pon an Ascent.

extent On the fide of this upper end it has a Pulle nall Knob, which is received into a remornall Sinus of the Fibula; and on its entre ore-part, a little below the Patella, it as another, into which the Tendons of nes, the ne Extensors of the Leg are inserted. or Food is lower Extremity, which is much a Comaller than its upper, has a remarkable triangue rocess which forms the inner Ankle, and called pretty large Sinus divided in the middle ty it has y a small Protuberance; the Sinus refoft and eives the Convex Head of the Astragalus, and the Protuberance is received into the reen the sinus in the Convex Head of the same and be sone. It has another shallow Sinus in the

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Of the Bones of the Thighs, &c. 2.86 fide of its lower end, which receives the

Fibula.

Fibula.

Aftragalus.

The outer and leffer Bone is call Herovn Fibula, or Focile Minus : thou it be much smaller than the Tibia, v tis nothing shorter. It lies in the outsi of the Leg, and its upper end, which not fo high as the Knee, receives the late un ral knob of the upper end of the Th into a small Sinus which it has in its in fide. Its lower end is received into fmall Sinus of the Tibia, and then it e tends into a large Process which for the outer Ankle, embracing the exten fide of the Aftralagus. The Tibia a Fibula touch not one another but at the ends; the space which they leave in the middle is fill'd up by a strong Membraous Ligament, and some Muscles white extend the Feet and Toes. The state of the s

In the Foot we distinguish three Pan

the Tarsus, Metatarsus, and Toes. The Tarsus is the space between the The Bones Bones of the Leg and the Metatarfus; of the Tarfus are is composed of seven Bones.

The first is call'd the Astragalus or Tal

in its upper part it has a convex Hea which is articulated with the two Food of the Leg by Ginglymus, being it divided by a little Sinus which receive the fmall Protuberance in the middle the Sinus of the Tibia. And without the

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&c. eivest Articulation, we must always, in going, have trod upon the Heel with our fore s call Foot, and upon our Toes with our thou hind Foor. The fore-part of the Afrabia, y galus, which is also Convex, is received to outside into the Simus of the Us Naviculare. which Below, towards the hind part of its the late under side, it has a pretty large Simus the The which receives the upper and hind its import of the Os Calcis. But towards the intot ore-part of the same side, it has a Proen it to tuberance, which is received into the uph for per and fore-part of the fame Bone. Beextent wixt this Sinus and this Protuberance Tibia a there is a Cavity which answers to anotat at the ther in the Os Calcis, in which is containe in the ed an oily and mucous fort of Substance Membra for moistening the Ligaments, and facilitating the obscure Motion of these Bones es white when we go.

The second Bone of the Tarfus is the Calcane-Calcaneum, Os Galcis, or Heel Bone; it um. is the biggest of the Bones of the Tarfus. It lies under the Aftragalus, to which it is articulated by Ginglymus, as we have now describ'd. Behind, it has a large Protuberance which makes the Heel, and into which the Tendo Achillis is inserted; and before, it has a Cavity which receives a part of the Os Cubireceive

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Navicu- 1 The third is the Os Naviculare or Cyllare. biforme; it lies between the Astragal biforme; it lies between the Astragal ex and the three Ossa Cuneiformia. Behin ac it has a large Sinus, which receives the fore convex Head of the first; and be fore it is convex, distinguished in the three Heads, which are received in the

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Offa Cuneiformia.

The fourth, fifth and fixth are call led Offa Cunciformia, because they are large above, and narrow below; the lie all three at the fide of one another their upper fide is convex, and the under hallow, by which means the Mu cles and Tendons in the Sole of th Foot are not hurt when we go. At on end they have each a Sinus, which is ceives the Os Naviculare, and at the ther end they are joined to the three it ner Bones of the Metatarfus; the inmo of these Bones is the biggest, and the in the middle the least.

Os Cubiforme.

The feventh Bone is called the Cubiforme, because of its Figure; lies in the fame Rank with the of Cuneiformia. Behind it is joined to the Os Calcis, before to the two out Bones of the Metatarfus, and on its is fide it is joined to the third Os Cuncifor me.

Metatarfos.

The Bones of the Metatarfus are five that which sustains the great Toe is the thicke

Of the Nails, &c.

or cynickest, and that which sustains the astragal ext Toe is the longest, the rest grow Behin ach shorter than another. They are ives thonger than the Bones of the Metacarpus; and be other things they are like them, and ned in hey are articulated to the Toes, as they wed in he to the Fingers.

The Bones of the Toes are fourteen. The Bones

are calle great Toe hath two, and the rest of the Toes, hey are each three; they are like to the v; the ones of the Fingers, only they are nother torter.

In the Toes there are sometimes found the Mu velve Ossa Sesamoidea, as in the Finers.

### SECT. XV.

Of the Nails, and Number of the Bones.

THE Nails which are upon the Extremities of the Fingers and Toes, the of coofs of other Animals. If you take the of to the coof carefully off a Horse, Ox, or Hog, out ou shall see that it is nothing but a bune of finall Husks which answer to so any Papilla of the Skin. From whence e may conclude, that the Nails are noing but the covers or sheaths of the Pape is the la Pyramidales of the Skin on the Extre-

&zc.

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Of the Nails and Bones, &c.

mities of Fingers and Toes, which do harden and lie close upon one another Their Use is to defend the ends of the Fingers when we handle any hard a rugged Body.

# The Bones of a Skeleton, are,

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Scapula 2
Clavicula 2
Cofta 24
Sternum E
Offa Innominata 2

The Humerus 2
Ulna 2
Radius 2
Offa Carpi 16
Metacarpi 8
Digitorum 30

The Os Femoris 2
Rotule 2
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Metatarfi 10
Digitorum 28

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Besides the Ossa Sesamoidea, which are said to be found to the Number of 48.

### CHAP. VI.

Of the Muscles which are not yet described.

#### SECT. I.

Of the Muscles of the Face.

THE Eye-brows have each a Mulcle call'd Corrugator. It arises from the great Canthus of the Orbit, and terminates in the Skin about the middle of the Eye-brows. Some reckon this Pair only a Prolongation of the Frontales; their Name declares their Use.

The Nose has three Muscles. The first arises from the end of the upper two Bones of the Nose, and are inserted into the upper part of the Ala. They pull the Nose upwards.

The second Pair arise from the of Maxillare, and are inserted into the sides of the Ala. They dilate the Nostrils.

The third Pair arises from the same

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Bone, above the Dentes Inciferii, and are inserted into the Extremities of the Ale. which they pull downwards.

The Muscles of the Lips are five pro-

per Pair.

The Incifious, or Elevator Labii Suberioris; it arises from the upper part of the second Bone of the Upper Jaw, and descending obliquely, is inserted into the Upper Lip above the Dentes Inciforit.

Its Antagonist is the Triangularis, or Depressor Labii Superioris; it ariseth from the lower edge of the Lower Jaw, be-tween the Massater and the Quadratus, and ascendeth by the Angle of the Mouth

to the Upper Jaw.

The Caninus, or Elevator Labii Inferioris; it ariseth from the second Bone of the Upper Jaw, below the Incifivus; it descends and passes under the Infertion of the Zygomaticus, and is inserted into the under Lip. This Muscle is assisted by another small but strong pair of Muscles, first observed by Mr. Cowper, and by him call'd Elevator Labii Inferioris: They arife from the Gums of the Dentes Inciforii, and descending directly, are inferted into the lower part of the Skin of the Chin. When they act, they pull the Skin of the Chin, and consequently thrust the lower Lip upwards.

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Its Antagonist is the Quadratus, Depreffor Labii Inferioris; this is for thin fleshy Fibres, which lie immed ate under the Skin upon the Chin, o each fide of the former; they arise from the edge of the forepart of the under bi Taw, and are inferted into the upper Lip

There are three Muscles common to

both the Lips.

The first and the fecond are Zygoma tici, one on each fide; they come from the Os Zygoma, and going obliquely they are inferted near the Angles of the Lips When one of these Muscles acteth, it draws both Lips obliquely to a fide; they receive often some Fibres from the Caninus.

The third is the Orbicularis, or Sphin-Her Labiornum; it furrounds the Lips with Orbicular Fibres; when it acteth, it

draws the Lips.

There is one Muscle on each fidecommon to the Lips and Cheeks, which is the Buccinator; it lies under the other Muscles; it makes the Inner Substance of the Cheeks; its Fibres run from the Processus Coronæ of the lower Jaw to the Angle of the Mouth, and they adhere to the upper part of the Gums of both Jaws. Through its middle pass the upper Dustus Salivales; by this Muscle we contract the Cavity of our Mouth, ace. rife from

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ratus, o fouth, and thrust the Meat between is fom it Teeth.

immed The Muscles of the Lower Jaw are

hin, o welve Pair, fix on each fide.

rise from The first is the Temporalu, or Crota-ne under hites; it arises by a semicircular fieshy per Lip eginning from a part of the Os Frantis, nmon a rom the lower part of the Parietale, and upper part of the Temporale. From Zygoma hence they go under the Zygoma, and nd upper part of the Temporale. From ne from athering together as to their Centre, ly they hey are inserted by a short but strong he Lips I'endon into the Processus Corona of the teth, it ower Jaw.

The fecond is the Massater; it is a om the hick and short Muscle; it arises from the Zygoma, and from the first Bone of the upper Jaw, and is inserted into the lower Edge of the lower Jaw, from its External Angle to its middle. Its Fibres run in three Directions; those which come from the Zygoma run obliquely to the middle of the Jaw; and those from the first Bone of the upper Jaw cross the former, and run to the Angle of the lower Taw; and the Fibres which are in its middle run in a perpendicular from their Origin to their Infertion. Thefe two Muscles pull the Jaw upwards.

The third is the Pterigoidaus Internus; it arises from the internal Part of the Processus Pterigoideus, and descends to

be inferred into the inferior part of the internal fide of the lower Jaw, near in Angle: When this Muscle acteth,

draweth the Jaw to a fide.

The fourth is the Pterigoidaus Extanus; it ariseth from the External par of the same Process, and goes backward to be inserted between the Processus Conditionals and the Corone on the inside of the Lower Jaw. This Muscle pulleth the

Lower Jaw forwards.

The fifth is the Quadratus; this is broad membranous Muscle, which lie immediately under the Skin; it arises from the upper part of the Sternum, from the Clavicula, and from the Acromium; it covereth all the Neck, and adhere firmly to the lower edge of the Lower Jaw; and being produced, it covers allow the lower part of the Cheeks. When this Muscle acteth, it pulleth the Cheeks and Jaw downwards.

The fixth is the Digastricus; it ariseth stelly from the upper part of the Processus Mastoideus, and descending it contracts into a round Tendon, which passes thro' the Stylobyoideus, and an annular Ligament which is fix'd to the Os Hyoides; then it grows stelly again, and ascends to the middle of the edge of the Lower Jaw, where it is inserted. When this Muscle acteth, it pulleth the Lower

Of the Mufcles of the Head.

law down, by help of the annular Puley, which alters its direction.

# SECT. II.

Of the Muscles of the Head.

THE Head is lifted up or pulled backwards by four pair of Muscles. The first is the Splenius, which ariseth rom the four upper Spines of the Vertere of the Back, and from the two lower of the Neck; and ascending obliquey, it adheres to the upper transverse Processes of the Vertebræ of the Neck, nd is inferted into the upper part of the Deciput.

The second is the Complexus; it ariseth rom the transverse Processes of the Verebræ of the Neck, and ascending obiquely it adheres to the Spines of the ame Vertebre, and is inserted into the ociput: When one of these Muscles Steth, it moves the Head backwards

o one fide.

The third is the Restus Major; it rifeth from the Spine of the second Vertebra of the Neck, and is interted into he lower part of the Occiput.

The fourth is the Restus Minor ;- it lies inder the Major: It cometh from the

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Of the Muscles of the Head.

back part of the first Vertebra of the Neck, and is inferted below the former They nod the Head back wards.

The femicircular Motion of the Hea

is performed by

The Obliques Inferior, which come in the Spine of the Come from the Spine of the second Vertebra of the Neck, and is inserted into the trans verse Process of the first.

The Obliques Superior comes from the transverse Process of the first Vertebra the Neck, and is inferted into the laten

and inferior part of the Occiput.

The Mastoidaus arises fleshy from the upper part of the Sternum and Extremin of the Clavicula; and afcending oblique ly, 'tis inferted into the back part of the Processus Mammillaris. When either of these Muscles acteth, the Head turnet to the contrary fide.

The Head is bended forwards by

The Redus internus Major, which a rifes from the fore-part of the five Inte rior transverse Processes of the Vertebra of the Neck, and is inferted into the foremost Appendix of the Occipital Bont near its great Hole.

The Redus Internus Minor, observed and described by that accurate Anato mist Mr. Cowper, in his most exact Tres tife of the Muscles; it lies on the fore part of the first Vertebra, like the

Restus

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# Of the Muscles of the Neck.

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of the lettus Minor on the back part, and is former plerted into the Anterior Appendix f the Os Occipion immediately under he Hear he former. These nod the Head forvards, being Antagonists to the Relli n come pinores.

Fallopius has described another Pair, he trans all'd Retti Laterales, which come from he transverse Processes of the first Verfrom the bra, and are inserted near the Processis ertebra o Mammillaris; they help to move the laters sead a little to one side.

## SECT. III.

## Of the Muscles of the Neck

ther the HE Neck is bended and extend-turned ed; it is bended by two Pair of Inscles.

by The first is the Longus, which is fahich a lened to the Bodies of the five upper ve Inte Vertebre of the Back, and to all those of Vertebre he Neck, but because the last are more nto the noveable than the first, therefore they re its Infertion, and those of the Back al Bone ts Origination.

The Scalenus arises from the first and econd Ribs; and ascending, is inserted A Tree into all the transverse Processes of the he fore Neck, except the first. This Muice ke the eems to be three; yet I will not en-

crease their Number. It is perforated for the Passage of the Veins, Arteries, and Nerves; because the Neck is more easily moved than that part of the Ribs to which they are fastened; therefore it's justly reckon'd among the Benders of the Neck.

The Neck is extended by the Mufcult

Vertebrales, of which afterwards.

## SECT. IV.

Of the Muscles of the Scapula.

THE Scapula is moved backwards and forwards, upwards and down-

wards, by four Muscles.

The first is, the Serratus Minor Anticus; it ariseth thin and sleshy, from the second, third, fourth and fifth superior Ribs, and ascending obliquely, it is inscreed sleshy into the Processus Coracoides of the Scapula, which it draws forwards; it helps also in Respiration.

The second is the Trapezius, or Cucullaris, because with its fellow it represents a Cowl; it arises from the Occiput above the Splenius, from the Spines of the Vertebra of the Neck, and from the eighth Superior of the Back, and is inserted into the Spine of the Scapula

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to the Acromium and Clavicle; it moves the Scapula obliquely upwards, directly backwards, and obliquely downwards, according to the three Directions of its Fibres.

The third is the Rhomboides, so called from its figure; it lies under the Cucidlars; it ariseth from the two inferior Spines of the Neck, and four Superior of the Back; and is inferted fleshy into the whole basis of the Scapula, which it draws backwards.

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The fourth is the Levator Scapula; it arises from the second, fourth and fifth manverse Processes of the Neck by so many distinct beginnings, which unite, and are inferted into the Superior Angle of the Scapula, which it draws upwards: It is also call'd Musculus Patientia, because those who are any ways grieved use it.

These Muscles may move the Arm, as those of the Arm move it, because of the Connexion of the two Bones: They help also in Respiration.

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ar bear, directly Of the Muscles of Respiration; and of the Benders and Extensors of the Vertebræ.

THE Cavity of the Thorge is dilate and contracted in Respiration by nine and twenty Pair of Muscles; fiv and twenty Pair pull the Ribs up, three Pair accelerate their Motion downwards and one Pair, Viz. the Diaphragma, help both in the one and the other; this la we have described already.

The Mufcles which dilate the Thora

in Inspiration, are, The Interni they are in number four and forty, one of each fort between every two Ribs they arise from the lower edges of each Superior Rib, and are inferted into the upper edges of each Inferior Rib. Their Fibres decuffate one another; those of the External run obliquely from the back part forwards, but those of the Internal from the forepart backwards.

The Subclavins arises from the lower fide of the half of the Clavicula that is nearest the Aeromium, and descends obliquely to be inferted into the upper fix part of the first Rib, near the Sternum. out 400 to "Tribe here have by

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The Serratus Antieus Major ; it comes STATE OF om the whole Bafis of the Scapula, and of the rest of the false Ribs, by 10 many bræ. inct Portions which represent the Saw. The Obliques Descentier

on by paces of its lower Indentation.

The Serratus Posticus Superior; it arithmeth by a broad and thin Tendon from the wards wo Inferior Spines of the Vertebræ of help he Neck, and the three Superior of the his late ack; and growing fleshy, tis inserted Thoras many distinct Indentations.

When all these Muicles act, they carrie he Ribs upwards, bringing the Ribs to you light Angles with the Vertebra; and Ribs, consequently the Cavity of the Thorax each out he wider and shorter: But because each nust be wider and shorter: But because of the t the same time the Diaphragma con-Their racts, therefore the Cavity is also onger.

The Muscles which contract the Ca-

ity of the Thorax, are,

The Triangularis; it arises from the lower ower part of the infide of the Sternum, has and is inferted into the Cartilages where hey join the Bones of the fourth, fifth, apper fixth, and sometimes seventh true Ribs.

The Serratus Posticus Inferior arises by a broad and thin Tendon from the three

Of the Muscles of Respiration, &c.

Inferior Spines of the Vertebra of the Back, and from the two Superior of the Loins; its Fibres ascending obliquely grow fleshy, and are inserted by four Indentations into the four last Ribs.

The Sacrolumbus; it arises fleshy from the Superior part of the Os Sacrum, Po sterior part of the Spine of the Ilium and from all the Spines and transverse Processes of the Vertebra of the Loins: It gives a small Tendon to the Posts rior part of each Rib near its Root where a small bundle of fleshy Fibra arises and unites with each ascending Tendon to the third, fourth, fifth and fixth Vertebra of the Neck. These Muscles are of small force, and seem only to accelerate the Motion of the Ribs, which fall down by their own gravity, and the elasticity of the Ligaments, by which they are bound to the Verte

The Muscles of the Back and Neck are very numerous, and varioufly described by Authors. I shall not multiply them, but take all that have the fame Direction and Disposition for the same Muscle, tho' perhaps it may be divided into as many Muscles as there are Verte bra. The first is,

The Longiffimus Dorfi. This Muscle at al I its beginning is not to be separated from

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Of the Muscles of Respiration, &c.

he Sacrolumbus, arising with it from the ack part of the Spine of the Ilium, and quely pper part of the Os Sacrum; and as it. y four feends it gives Tendons to each trans-erse Process of the Vertebra of the Loins, erfe Process of the Vertebra of the Loins, from horax, and Neck. When these Muscles a, they keep the Body erect. Under his lies its to me le voir ile entre orni wot

Sverle The Transversalis Dorsi, of which Auloins, hors commonly make three, viz. the Sa-Poste r, the Semispinatus, and Transversalis Root, colli. This Muscle arises from the Os Sa-Fibre um, and from all the Transverse Proending effes of the Vertebra of the Loins, Back, h and and Neck, except the two first, and is in-These erred by so many distinct Tendons to feem I their Superior Spines : This Muscle f the noves the whole Spine obliquely back-

n gravards.

nents, The Inter-Spinalis, of which the first Verte art is call'd (by Bidlow) Semi-Spinalis, nd the other part (by Mr. Cowper, who Neck iff observed them) Inter-Spinalis Colli: escrib They arise partly fleshy and partly tenditiply ous from the Spines of the Loins and the same inferior of the Thorax, and are inserted forms. fame no the fifth, fixth, and feventh Spines vided of the Thorax. These join the Longisti-Verth ous Dorsi. The other part arises from he Superior Parts of each double Spifrom he second Vertebra, and is inserted into the

&c.

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Of the Muscles of Respiration, &c. the inferior Parts of all the said Spine These Muscles draw the Spines of the

Vertebre nearer one another.

The Spinalis Colli. It arises from the Superior Transverse Processes the Vertebra of the Thorax, and inferior the Neck, and inferior Part of the Secon Vertebra of the Neck. They pull the Neck directly backwards.

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The Quadrates Lumborum. It arise from the posterior Part of the Spine the Ilium, and is inserted into the inserted of all the transverse Processes of the Vertebra of the Loins. This Must moves the Body upon the Loins to a side, and both together help the Rad Abdominis in bending our Body so wards.

The Vertebra of the Neck are bende by two Pair of Muscles, which have be already described. The Vertebra of the Back have no Benders, and those of the Loins are bended by the Muscles of the Lower Belly, and by one proper Pai which is call'd the Psoas Parvus; it arises she from the insides of the upper to tabra of the Loins, and it has a thin a broad Tendon which embraces the Pso of the Thigh, and which is inserted to the Os Innominatum, where the Os Psoas and Ilium join together.

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Paraller Carroller No rom to f the Muscles of the Humerus, or Arm.

inferior HE Arm moves five different ways. upwards, downwards, forwards, backrds and round. Armyon and And Har

The Arm is lifted upwards by the Itoides, Supra Spinatus, and Coracobrachi-

The Deltoides is of a Triangular Figure; e infi comes from all the Spina Scapula, from of the Acromium, from the External Half Muse the Clavicula; from all these Places s to a Fibres drawing together, pass above e Rea e Articulation of the Humerus, and dy for inserted by a short Tendon, four ngers below the Head of the same bend one, almost on its External Side. Steno e of the ection of its Fibres, it pulls also the of them a little forwards and backwards.

er Pai The Supra Spinatus rifes fleshy from per le Spine. It fills all that Space be-hin a een the upper fide of the Scapula he Phod its Spine, to which too it is also at-reduched: It passes above the Acromium, e Os Poet the Articulation of the Humerus, and inserted into the Neck of the Hume-E CT

Of the Muscles of the Humerus,

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The Coracobrachialis rifes from Processis Coracoides Scapulæ by a ten nous beginning; and passing over Articulation, it is inserted into the m dle and internal part of the Humerus.

The Teres Major and the Latissimus D

pull the Arm downwards.

The Teres Major rifes from the low Angle of the Scapula, and is infer with the following a little below Head of the Humerus.

The Latistimus Dorsi, or Aniscap with its fellow, covers almost all Back. It hath a thin and large ten nous beginning, which comes from Posterior part of the Spine of the Illifrom the Superior Spines of the Oscrum, from all the Spines of the Verm of the Loins, and from the seven Lor of the Thorax; it passes by the Inser Angle of the Scapula, from which so of its stessy Fibres sometimes arise, is inserted with the Teres Major by Associated and broad Tendon.

The Pettoralis moves the Arm f wards; it arifeth by a fleshy and so circular beginning from the inner h of the Clavicula from the six Super Ribs; it covereth a great part of t Breast, and is inferted by a short h Grong and broad Tendon into the up Of the Muscles of the Humerus.

inner part of the Humerus, between Biceps and Deltoides. Its Fibres near ir Insertion decussate each other. ofe which come from the Clavicle sirft Ribs are on the lower side of Tendon; and those from the insertible are on the upper side of the indon.

The Arm is drawn backwards by the ra Spinatus, the Transversalis, and the

fcapularis.

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The Infra Spinatus covers all the space t is between the Spine of the Scapula its inferior side; and passing between Spine and the Teres Minor, it is insertion the Neck of the Humerus.

The Transversalis, or Teres Minor, comes m the inferior edge of the Scapula, up-which it runs between the former the Teres Major, and is inserted into e Neck of the Humerus.

The Sub-scapularis covers all the Interfide of the Scapula; it rifes fleshy m its basis, from its upper and lower sta, and is inserted into the Neck of the Humerus. It draweth the Arm close the Ribs.

The Tendons of these three last uscles surround the Articulation of the imerus. When all these Muscles move coessively, they move the Arm circully.

SECT.

#### SECT. VII.

A VICTOR THE AND AND THE PARTY

Of the Muscles of the Cubitus and Radius.

THE Cubitus is bended and extended by fix Muscles; the Biceps and Bru chieus Internus bend it; the Longus, Brain, Brachieus Externus and the Anconement extend it.

The Biceps is so called, because hath two Heads, of which one rife from the upper edge of the Cavity the Head of the Scapula. This Hea is round and tendinous, and is enclose in the Channel in the Head of the Hu merus. The other arises from the Prod fus Coracoides; it is broad and tendinous and both together unite about the mid dle and forepart of the Arm, and make one Belly, which is inferted, by a ftrong and round Tendon, into the Tuberch at the upper end of the Radius. Som of the Fibres of this Tendon form large and thin Eponewrofis, which cover all the Muscles of the Radius and Fin gers externally. Care ought to be ta ken in Blood-letting, not to cut a-cross but according to the length of the Fi bres of this Aponeurafis.

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The Brachieus Internus lies partly under the Biceps; it arises by a fleshy beginning from the middle and internal Part of the Humerus, and is inferted into the upper and forepart of the Cubitus by very short but strong Tendon.

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The Longus is the first of those which d Bre extend the Cubitus; it ariseth from the us, Br Inferior Costa of the Scapula, nigh its conen Neck, and paffeth betwirt the two round Muscles; it descendeth upon the back sufe i fide of the Humerus, where it joins with the two following.

The Brevis arises from the Superior

Hea and Posterior Part of the Humerus.

The Brachieus Externus arises about the middle and posterior Part of the Humerus. These three join their fleshy Fibres together, and being externally tendinous, they cover all the Elbow, and are inferted into the Olecranium.

The Anconausis a small Muscle which atifes from the back part of the Extremity of the Humerus, passes over the Elbow, and is inferted into the lateral and internal Part of the Ulna, about three or four Fingers Breadth below Olecranium.

The Radius hath four Muscles, two Pronatores, which turn the Palm of the Hand downwards, they are the Rotundus and the Quadratus: and two Supinatores,

which

called Longus and Brevis.

The Rotundus arises fleshy from the Internal Extuberance of the Humen and goes obliquely to be inferted in the middle and external Part of the Radius.

The Quadratus arises by a broad an fleshy beginning from the lower and i ternal Part of the Ulna; it passes over the Ligament that joins the Radius the Ulna, and is inferted as broad as i beginning into the external and low part of the Radius.

The first of the Supinatores is the Longus; it ariseth by a fleshy beginning three or four Fingers breadth aboved external Extuberance of the Humerus, lies all along the Radius, to whose infe rior and external Part it is inserted by

a pretty broad Tendon.

al vide

The second is the Brevis; it comet from the external and upper Part of the Ulna, and passing round the Radins, 'ti inferted into its upper and forepart, be low the Tendon of the Biceps. a florida in the second of the

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of the Muscles of the Palm of the Hand, and of the Wrift.

HE Muscles of the Palm of the Hand are two.

The first is that which is commonly nown by the Name of Palmaris; it iles from the internal Extuberance of e Humerus, and by a long and slender endon it passes above the Ligamentum mulare to the Palm of the Hand, where expands it felf into a large Aponeurofis, hich cleaves close to the Skin above, d to the Sides of the Bones of the Mecarpus below, and to the first Phalanx the Fingers, by which means it makes ur Cases for the Tendons of the Beners of the Fingers to pass through. This uscle is sometimes wanting, but the omed uscle is sometimes wanting, but the of the concurosis is always there.

The second may be called Palmaris

rt, be evis; it lies under the Aponeurosis of e first; it arises from the Bone of Metacarpus that sustains the little inger, and from that Bone of the repus that lies above the rest. It goes ansversly, and is inferted into the CT ghth Bone of the Carpus. The first lists the Hand to grasp any thing closely, Of the Muscles of the Hand.

closely, and the second makes the Pala of the Hand Concave.

The Muscles of the Wrist are four

External for extending it.

The first is the Cubitans Interms; arises from the internal Extuberance of the Humerus and upper part of the Ulmupon which it runs all along till it particle the Ligamentum Annulare, and inserted by a strong and short Tendo into the fourth of the first Order of the Carpus.

The second is the Radieus Internation which comes from the same part with the former, and lying along the Radie it is inserted into the first Bone of the Metacarpus that sustains the fore Finge These two Muscles bend the Wrist.

The third which is the first of the Entensors, is the Cubit eurs Externus; it con eth from the external Extuberance of de Humerus, and passing its Tendon und the Ligamentum Annulare, 'tis inserted it to the fourth Bone of the Metacarpus the sustains the little Finger.

Bicornis, which is two distinct Muscles the first arises from above the extern Protuberance of the Humerus, and the second from the lowermost part of the external Protuberance. They both in

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Of the Muscles of the Fingers.

clong the external Part of the Radius; they pass under the Annular Ligament, and the one is inserted into the Bone of the Metacarpus that sustains the fore Finger, the other to that which sustains the middle Finger; these two entend the Wrist.

## SECT. IX.

Of the Muscles of the Fingers.

THE Fingers are bended and extended, they are drawn to and from the Thumb by several Muscles. The Muscles which bend them are the Subli-

mi and the Profundus.

The Sublimis otherwise call'd Perforatus, arises from the Internal Protuberance of the Humerus, and from the upper and forepart of the Radius: It divides into four parts, which fends four Tendons, which pals under the annular Ligament to be inferted into the upper part of the second Phalanx of each of the four Fingers. Each of these Tendons, as they pass the first Internode of the Fingers, have a flit in their middle, for the Paffage of the Tendons of the Profundus, which lies under the Sublimis; it arifeth fleshy from the upper part of the Ulna, and from the Ligament that joins this Bone to the Radius. The lower part of

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its Body is outwardly tendinous; it divides into four round Tendons which pals under the annular Ligament, and through the Slits of the former Tendons, to be inferted into the third Bone

of the Fingers.

These Muscles have this in particular, that the Tendons of the uppermost give Passage to the Tendons of the lower: And heir Tendons upon the Palm of the Hand are enclosed in Cases from the Aponeurosis Palmaris, and upon the Fingers in strong Membranous Cases which are fix'd to the sides of each Finger.

The Extensor Digitarum Communis arises from the External Protuberance of the Humerus, and at the Wrist it divides into three flat Tendons, which pass under the annular Ligament, to be inserted into all the Bones of the fore, middle, and Ring Finger. These Tendons, near the first Internodes of the Fingers, give some tendinous Fibres to each other, and some also to the Interosse.

The Lumbricales, or Vermiculares, are fmall Muscles which rise from the Tendons of the Profundus, and are inserted into the first Internodes of each Finger. On their internal Sides next the Thumb they assist in bending the first Joint of

the Fingers.

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The Interoffei, some reckon fix, and others, more juftly, eight; they are contained betwixt the Spaces of the Bones of the Metacarpus; the one half of them lies betwixt the Spaces that thefe Bones leave towards the Palm of the Hand; they are the internal fateroffei; they arife from the upper part of the Bones of the Metacarpus next the Carbus, and they are inferted on the internal Sides of the first Bones of the Fingers with the Lumbricales; they are the Abdustores Digitorum, for they bring the Fingers to the Thumb. The other half are contained in the Spaces that the Bones of the Metacarpus leave on the back of the Hand; they rife from the upper part of the Bones of the Metacarpus next the Carpus, and they are inferted on the external Sides of the first Bones of the Fingers, and these are the Abductores Digitorum, for they draw the Fingers from the Thumb.

The Thumb is bended by two Muscles. The first arises frem the internal Extuberance of the Humerus, from the middle and inner part of the Radius, by two different Orders of fleshy Fibres; and passing under the Ligamentum Annulare, its Tendon is inserted into the third Bone of the Thumb. The second arises from the Bones of the Carpus, from the annu-

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lar Ligament, and is inferted into the second Internode of the Thumb: Their two Muscles are call'd Flexores Pollicis.

It is extended by three Muscles, which

are,

The Extensor Primi Internodii Pollicis. It raises from the upper and external part of the Ulna; it passes obliquely over the Tendon of the Radieus Externus, and is inserted near the second Joint of the Thumb.

The Extensor secundi Internodii Pollici. It arises from the upper and internal part of the Radius, and is inserted into the upper part of the second Bone of the

Thumb.

The Extensor tertii Internodii Pollicis. It arises from the Ulna, a little below the first Extensor, and is inserted into the

third Bone of the Thumb.

The Tenar draws the Thumb from the Fingers; it makes that part which is call'd Mons Lunæ; it arifeth from the Ligamentum Annulare, and first Bone of the Carpus, and is inserted into the External side of the Thumb.

The Antitenar draws the Thumb to the Fingers; it rifeth from the Bone of the Metacarpus that sustains the fore Finger, and is inserted into the first Bone

of the Thumb.

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The Abductor Indicis arises from the fore part of the first Bone of the Thumb, and is inferted into the Bones of the fore Finger; it draws this Finger to the Thumb.

The Index hath a particular Extensor, which comes from the middle and external part of the Ulna; it passeth under the annular Ligament, and is inferted into the third Bone of the fore Finger, where

it joins the Extenfor Communis.

The little Finger hath two proper Muscles, the one draws it from the other Fingers, the other extends it. The first is call'd Hypotenar; it ariseth from the fourth Bone of the fecond rank of the Bones of the Carpus, and from the Ligamentum Annulare, and is inserted externally into the first Bone of the little Finger; this draws it from the other Pingers.

The Extensor of the little Finger arises from the external Protuberance of the Humerus, and from the upper part of the Ulna; it paffeth under the annular Ligament, and is inferted into the third Bone

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of the little Finger. 

THE ASSESSED BOY P. 4. HELD SECT.

# SECT. X.

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### Of the Muscles of the Thigh.

THE Thigh is bended and extended moved outwards and inwards, obliquely and circularly, by thirteen Mulcles.

It is bended by the Pfo.s., Iliacus, and Pettineus.

The Ploas arises from the internal Side of the transverse Processes of the Vertebre of the Loins, within the Abdomen; and descending upon part of the internal Side of the Ilium, it is inferted into the lower part of the little Trochanter.

The Iliacus arises from the internal Cavity of the Os Ihum; and descending, it joins with the former, with which it is also inserted.

The Pettingus arises from the External part of the Os Pubis, and is inferted a little below the leffer Trochanter,

The Thigh is extended by the Glutans

Major, Medius and Miner.

The Glutaus Major arises semicircu-1 rly from the Os Coccygis, the Spines of the Sacrum, from the Spine of the Ilium; and from a strong Ligament that runs between the Sacrum and Tubercle of the Mebium; and descending, 'tis inserted

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into the Linea Aspera, four Fingers breadth below the great Trochanter.

The Glutaus Medius arises from all the Spine of the Ilium under the former, and is inserted into the superior and external Part of the great Trochanter.

The Gluteus Minor arises from the lower Part of the external Side of the Ilium, under the former, and is inserted at the superior part of the great Tro-chanter.

The Thigh is moved inwards, or they are both brought together by the Triceps, which hath three Originations and three Infertions, and may be divided into three Muscles.

The first arises from the Os Pubis, and is inserted above the second in the Linea Aspera of the Thigh Bone.

The second arises from the lower part of the Os Pubis, and is inserted about the middle of the Linea Aspera.

The third arises from the Os Pubss, where it joins the Os Ischium, and is inserted from a little below the second to the internal and lower Apophysis of the Thigh-Bone. When they act they pull the Thigh Bone inwards, and turn it a little outwards.

The Thigh is turned outwards by the Quadrizemini.

The first is the Pyriformis, of Iliam Externus; it rifes round and fleshy from the Inferior and Lateral part of the 0s

Sacrum, and is inferted with

The second and third, call'd Gemini, which arise from the Protuberance of the Ischium, and are inserted with the first in the dent at the Root of the great Trachanter.

The fourth is the Quadratus; it comes from the Protuberance of the Ischium, and is inserted into the outside of the

great Trochanter.

The Thigh is moved circularly and obliquely when these Muscles act successively, but particularly by the two Obta-

ratores.

The Obtarator Internus comes from the Internal Circumference of the Hole that is between the Ischium and Pubis; and passing through the Sinuosity of the Ischium, it is inserted into the Dent of the great Trochanter. Its Tendon lies between the Gemini; it turns the Thigh to the outside.

The Obsurator Externus comes from the external Circumference of the same Hole as the former: It embraces the Neck of the Thigh Bone, and passes under the Quadratus to the small Cavity of

the great Trochanter.

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# SECT. XI.

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Of the Muscles of the Leg.

THE Leg is bended by four Muscles, and extended by four others. The Muscles which bend it, are,

The Semi-nervosus, which arises from the Protuberance of the Ischium, and is inserted by a round Tendon into the internal Part of the Epiphysis of the Tibia.

The Semi-membranofus arises tendinous from the Protuberance of the Ischium, immediately below the former, and is inferted by a large Tendon into the upper and back part of the Tibia.

The Biceps, so called because it has two Heads, of which one comes from the Tuberosity of the Ischium, the other from the middle of the Linea Aspera, both which join together, and are inserted by one Tendon into the Superior and External Part of the Perone.

The Gracilis arises from the Union of the Os Pubis and Ischium, and descending by the infide of the Thigh, it grows tendinous, and is inserted into the superior and internal side of the Tibia.

The Leg is extended by four Muscles, which are,

The

The Redus; it arises from the lower Part of the Spine of the Ilium, and descending between the two following, it's inserted with them.

The Vastus Externus, which comes from the Root of the great Trochanter, and

part of the Linea Afpera.

The Vastus Internus, which arises from the root of the lesser Trochanter.

The Crurens, which comes from the fore part of the Thigh Bone, between the great and leffer Trochanter, and lying close upon the Bone, it joins its Tendon with the three former, which all together make one broad Tendon, which passes over the Patella, and is inserted into the little Tuberosity on the upper and forepart of the Tibia.

The Leg is moved obliquely by three

Muscles.

The Longus or Sartorius; it arifes from the inferior Part of the Spine of the Iliam, and running obliquely by the infide of the Thigh, is inferted into the Internal Side of the Tibia, three or four Fingers breadth below its upper Extremity. By this Muscle we throw one Leg and Thigh cross another.

The Poplitans; it arises from the External and inferior Protuberance of the Thigh Bone, and passing over the Joint obliquely, is inserted into the superior

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Exthe oint ior dinternal Part of the Tibis. This at is in bending of the Leg, and turns it little inwards.

The Membranofus, or Fascia Lata, which iles fleshy from the forepart of the pine of the Hum, and a little below becomes membranous or tendinous, and covers almost all the Muscles of all the Muscles of this Muscle helps in extending of the eg, and turns the Leg a little out ards.

## de E.C. T. XII. id ad I

Of the Muscles of the Foot.

THE Foot is bended by the Tibialist and Peroneus Anticus.

The Tibialis Anticus arises fleshy from the upper and forepart of the Tibia, and adhering to the external Side of the Tibia, as it descends it passes under the Ligamentum Annulare, and is inserted into the Os Cuneiforme, which answers to the Great Toe.

The Peroneus Anticus is joined to the Posticus at its Origination, which is from the upper and external half of the Perone; and running through the Channel which is in the external Ankle, 'tis inferted into

the

Of the Muscles of the Foot.

the Os Metatarfi that fustains the Gr.

The Foot is extended by four Muscle The first and second are the Gasteron mius or Gemellus, which with the Sola make the Calf of the Leg; the one rises from the back part of the Intern Protuberance of the Thigh Bone, these ther from the same part of the Extern Protuberance of the same Bone: The have two large fleshy Bellies, which jou and make one Tendon with the following, which is inserted into the Os Calen,

The third is the Solow, which lies under the former; it arises from the upper and back part of the Tibia and Perons and descending, it joins its Tendon with the former. The Tendon of these three Muscles is big and Grong, call'd Tendo

Achillis.

STATULE.

The fourth is the Plantarn; it has a fleshy Origination from the back part of the External Protuberance of the Thigh Bone; and descending a little way between the Gemellus and Soleus, it becomes a long and slender Tendon, which marches by the inside of the great Tendon, and at the Sole of the Foot it is expanded into a large Aponeurosis, which has the same use, situation and connexion, as that of the Palm of the Hand.

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Of the Muscles of the Toes.

The Foot is moved fide-ways by two uscles.

The Tibialis Posticus, which arises from e superior and back part of the Tibia ne Soland Fibula, and Membrane that ties them gether, and descending by the hind e one Interment of the Tibia, it passes through the iffure of the inner Ankle, and is infertthe into the under fide of the Os Navicam; it moveth the Foot inwards.

The Peroneus Posticus arises from the follow aperior and external part of the Peme; and descending, it passes through he Fiffure of the external Ankle under he Sole of the Foot, to be inferted into he Os Metatarfi that futtains the little Toe. When this Muscle acteth, it pul-

eth the Foot outwards.

#### SECT. XIII.

Of the Muscles of the Toes.

THE four leffer Toes are bended, and extended, and moved fideways.

They are bended by the Perforans and

Perforatus.

The Perforans arises from the upper and back part of the Tibia, and passing under the inner Ankle, and Ligament that ties the Tibia and Os Caleis together, it divides

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divides into four Tendons, which no through the Holes of the Perforatus, a inferted into the third Bones of each lesser Toe. There is a Massa Carm that arises from the Os Calcis, and which joins the Tendons of this Muscle when the Lumbricales begin.

The Perforatus, or Flexor Brevis, arise from the inner and lower part of the Os Calcis, and is inserted by four Ter dons into the second Phalanx of each Toe. These Tendons are perforate to give way to the Tendons of the Pa

forans. I have been a sound of

The Toes are extended by the Longin

and Brevis.

The Longin comes from the superior and external Part of the Tibio, and from the upper Part of the Fibula; and being divided into five Tendons, it passes under the Ligamentum Annulare, and is inferted into the third Bones of the leffer Toes, and into the Os Metatarsi that suflains the little Toe.

The Brevis lies under the Tendons of the former, and arises from the external and forepart of the Os Calcis, and is inferted by five Tendons into the second Rhalanx of the Toes: These Tendons cut the Tendons of the former at acute Apgles.

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endons of the Perforans, and are infered into the infide of the leffer Toes. The eight Interoffei, which lie betwixt ne Bones of the Metatarius, have the me Situation, Use, Origination and fertion as those of the Hand.

The Abductor Minimi Digiti arises om the external Part of the Os Calcis, id lying upon the outlide of the Os Metatarfi, that fullains the little Toe. is inferted into the upper part of he first Bone of the same Toe exterallv.

The great Toe is bended, extended, nd moved fideways by feveral Muicles.

The Flexor Pollicis Longus ariles from he upper and back part of the Fibula, nd passing behind the inner Ankle, 'tis. efferted into the last Bone of the great Foe: 10

The Flexor Pollicis Brevis; it ariseth rom the Os Cuneiforme medium, and is inerted into the Offa Sesamordea upon the econd Joint of the Great Toe.

The Extensor Pollicis arises from near he upper half of the Perone forwardly; nd passing under the Ligamentum Annuare, is inferted into the last Bone of the great Toe.

The Tenar, or Abducens Pollicis arifes. from the Os Calcis, and from the Cuneiforme

## A Table of the Muscles,

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forme Majus, and is inferted into thee ternal fide of the Os Sefamoides.

The Antitenar, or Abdactor Pollicis, riles from the inferior part of the thi Os Cuneiforms, and paffing obliquely, inserted into the inside of the Offat moidea.

The Transversalis comes from the Bo of the Metatarfus that fuffains the T next the little Toe, and passing acr the other Bones, 'tis inferted into the Sesamoides of the great Toe : Its is to bring all the Toes close to one; ther.

### ATABLE of the Muscli

They pull the St The Mul-L Romales, cles of the of the Forche Forehead upwards. They pull the Sk are one Occipitales, Pair. of the Hindher upwards. Of the Hindhead Attollens Auricula one Pair. Deprimens

Internus Malleoli. Of the Ears fix Pair.

Externus Malleoli,

and from the Queen

It distends the Ty panum. It relaxes the Tym panum.

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cisivus,

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riangularis,

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nadratus.

Nares

thee liquus Malleoli, feulus Stapidis, It moves the Stir-Of the Eyebrows ollicis. rop. one Pair. he thi rugator Supercilii. Hus Palpebra Supe- It lifts up the upper Eyelids, uely, Mas rioris, Eye-lid. two Pair. bicularis Palpebra- It shuts both Eyehe Bo lids. rum, Eyes, Ex he T tollens Pair. primens ( Oculoact e the ductor rum, IduStor lts II

liquus Major, It pulls the Eye
forwards , and
obliquely downwards.
liquus Minor, It pulls the Eye for-

wards and obliquely upwards.

Nose Pair.

It pulls the upper Lips, for Lip upwards. Pair and It pulleth it down-one single wards.

They pull the lower Lip upwards.

It pulleth it down-

Zygo-

Geniogloffus, Ceratoglossus,

Os Hyoi- Geniobyoidaus, Pair.

It draws both ! obliquely to ther Side.

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and the Chee downwards.

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It drawsthe Tong upwards.

It pulls it out of the Mouth.

It pulls it into the yter Mouth.

It pulls Os Hyoid leniu and Tongue w mple wards and for wards.

Sterne

es. A Table of the Muscles. both 1 It pulleth the Os pohyoidaus, ly to Hyoides downe. wards. ooth I bvoidæus, It pulls it obliqueľ. ly upwards. the M cobyoidans, It pulls it obliquely ur Te downwards. the hopvoideus, It pulls it to either fide, and fomeie Jan what upwards. te. o-Pharing ous, It pulleth up and Of the the ] dilateth the Pha-Pharynx, two Pair. rynx. the Jophagaus, It straitens the Pha-Chee Mod ashing head rynx ... ds. nothyroidaus, It pulls the Thyroi-Larynx, the J des downwards. feven Pair . ls. hyroidaus, It pulls the Thyroie Un des upwards. othyroidaus, coarytænoidæus Poticus. ong coarytanoidaus Lateralis. of the groary tanoidaus, It dilates the Glostis. to the ytænoidæus, It contracts the Glot-Hyoid lenius, ? They move the Head, ten e up mplexus, Head backwards. Pair. for Rettus

Sterno

Retus Major,
Retus Minor,
Obliquus Inferior,
Obliquus Superior,
Maftoideus,
Retus Internus
Major,

Rellus Internus Mi

Rectus Lateralis,

Intercostules Interni
& Externi,
Subclavius,
Serratus Anticus
Major,
Serratus Posticus Superior,

Triangularis,

STORESTO 10

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Thorax.

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Serratus Posticus Inferior, Sacrolumbaris,

Diaphraguea;

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They nod the He backwards.
They performs

They perform Semicircular tion of the He

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They nod the He forwards.

It nods the Head one fide.

They pull the Ri upwards in Inf ration.

Thinks of Page

They make the M tion of the R downwards, Expiration, t fwifter.

Its Use is both Inspiration, a Expiration.

Oblique

A Table of the Mufcles.

liquis Externus, liquus Internus, ansversalis. Aus. ramidalis.

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ongiffimus Dorfi,

ranfverfalis Dorfi,

ter pinalis,

uadratus Lumborum,

heM ongus, calenus foas Parvus

Cremafter,

Erectores Penn, Transversalis Penis, They compress all Lower the Parts contain-Belly, five ed in the Lower-Pair. Belly; affift the Motion of the Ribs downwards in Expiration, and help to bend the Vertebra of the of the Loins forwards.

Vertebra, It keeps the Body e- feven Pair.

It moves the Body obliquely backwards.

It draws the acute Processes nearer one another.

It draws the Vertebra of the Lains to one fide.

They bend the Vertebre of the Neck. It helps to bend the

Vertebre of the Loins.

It draws up the Te- The Mufflicles in the act cles of the of Generation. Privities in Men

are four Pair.

Accelera-

by suppositions in

Clitoris, Erectores Clitoridis one Pair.

One fingle Sphintler Vefica, Muscie of 4月1、入野菜和白种物料 the Blad-Rica dognamal der.

Levatores Ani, Of the Anus Sphintler Ani, three fin-

gle Muf-Serratus Anticus Micles.

Trapenius, Of the Shoulder-Blades

Remboides, four Pair. Levator Scapula,

Deltoides. Of the Supra Spinatus, Shoulder-Coracobrachialis. Bones, nine Pair. Teres Major, Latifimus Dorfi.

stell the

and the . 梅女生

Pettoralis,

ESTA PROPERTY

Infra Spinatus, Transversalis, Subscapularis,

It contracts the Ne of the Bladde that the Uri may not run con tinually.

They draw up th Anus.

It shuts the Anus. It draws the Show der Blade forward It moves it upward backwards, an downwards.

It pulls it backward It pulls the Shoul der-Bladeupward

They lift the Arm upwards.

They pull the Arm downwards. It moves the Arm forwards.

They draw the Arm backwards.

the sect Menny

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A Table of the Muscles. They bend the fore-Cubiti, fix iceps, Arm. rachiaus Internus, ongus, eNe They extend the revis, ladde rachieus Externus. fore Arm. Uri ncon eus, They perform the of the in co Motion of Prona-Radii, otundus. rion, or they turn four pair. up th the Palm of the nadratus, Inus. Hand downwards. Shou They perform the ward ongus, Motion of Supination, or they turn ward the Palm of the an revis, Hand upwards. ward ubstæus Internus, They bend the Wrifts Shoul adieus Internus. Wrift. four pair. whiteus Externus, ward They extend the Arn adieus Expernus Wrift. almaris. It helps the Hand to Of the grafp any thing Palms of Arm closely. the Hands It makes the Palm of two pair. almaris Brevis. Arm the Hand concave. ublimis. They bend the Fin- Of the rofundus. gers. Fingers. Arm xtenfor Dizitorum fifteen Communis, pair. umbricales, They affir in bend-. Biing the first Joint of the Fingers. Interoffei

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Interoffei Externi,

Interoffei Internion They draw the Fr gers to the Thum They draw the Fir gers from

Thumb.

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The parti- Flexor Pollicis Longus, cular Muf- Flexor Pollicis Brevis, cles of the Extensor Primi, Thumbs, Secundi. are feven Te tii Internopair.

dii Pollitis, Tenar,

Antitenar,

Of the Abductor Indicis, Forefingers, two Extensor Indicis. Hypotenar, pair.

Of the little Fin- Extensor Auricularis, gers, two Pfoas, pair. Iliacus, The Muf-Petinans, cles of the Glutaus Major. Thighs Glutaus Medius, are thir-Glutæus Minor. teen pair. Triceps,

> Pyriformis, Gemini, Quadratus,

It draws the Thum from the Finger It draws the Thum to the Fingers.

It draws the little Finger from the

Thev bend th Thigh.

They extend Thigh.

It pulls the Thigh inwards.

They move Thigh outwards

Obtu-

he Fir Obturator Internus, They help to move humb he Fin . nus, all awarts ( n th Semi-nervo us, e mand

Semi-membranosus, Biceps, Gracilis,

Rettus, Vastus Externus, Vaftus Internus, Crureus, Sartorius,

Poplitæus,

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**Thigh** 

vards

Obtu-

Membranofus,

Tibialis Anticus, Peronaus Anticus, Gaftrocnemii, Solaus, Plantaris,

Peroneus Posticus,

Tabialis Posticus,

Profundes, Sublimis, Lumbricalis, Longus, Brevis,

Obsurator Enter-C the Thigh obliquely, and circularly.

> They bend the Legof the Legs, ele ven pair.

extend the Leg.

It makes the Legs cross one another. It turns the Leg fomewhat inwards. It turns it a little outwards.

They bend the of the Foot. Feet, eight

They extend thepair. Foot.

It moveth the Foot It moveth the Foot outwards.

They bend the four Of the leffer Toes. Toes

They extend the twenty four leffer Toes. four pair.

Flexor Q 2

## A Table of the Mufdes.

Flener Pollicis, Extensor Pollicis Tenar.

Antitenar-

It draws the great Toe from the reft. It draws it to the reft.

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Flexor Pollicis Longus, - Brevis Abductor Minimi Digiti,

Interoffei Interni

Interoffei Externi,

Transversalis,

No assistant or a selection of

atun

They draw the Toes to the great Toe. They draw them from the great Toe.

It brings all Toesclose to one another.

In all 446 fingle Muscles in the Body.

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too it will be to me to the many a what now that fucls affactured the body is

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the Acceptor through and the South; when To

#### CHAP. VII.

CHIEF CHAPTER STATE OF THE

Of the Nerves, Veins and Arte-

#### SECT. I.

Of the Nerves in general.

A Nerve is a long and small bundle of very fine Pipes, or hollow Fibres, wrapt up in the Dura and Pia Mater; which last not only covers them all in common, but it also encloses

every Fibre in particular.

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The Medullary Substance of the Brains is the beginning of all the Nerves; and its probable that each Fibre of the Nerves answers to a particular part of the Brain at one end, and to a particular part of the Body at its other end, that whenever an Impression is made upon such a part of the Brain, the Soul may know that such a Part of the Body is affected.

The Nerves do ordinarily accompany the Arteries through all the Body, that the Animal Spirits may be kept warm, and moving, by the continual heat and Q 3. pulse

pread pulse of the Arteries. They have all ne O Blood-Veffels as the other Parts of the Body: These Vessels are not only Th partl spread upon their Coats, but they ru pora . alfo amongst their Medullary Fibres, a Nervi may be seen amongst the Fibres of the moff Retina. Where-ever any Nerve fends ing out a Branch, or receives one from ano-Cella ther, or where two Nerves join toge 2021 ther, there is generally a Ganglio or Hol Plexus either less or more, as may be seen at the beginning of all the Nerves of the Medulla Spinalis, and in many o ther Places of the Body. Charles and the season of the season

## S.E.C.T., II.

mer or in the county street a light of the county Of the Nerves which come immediately out of the Skull.

drea gray mortacione

THE Nerves are divided into those A which come immediately out of the Skull, and those which come out between the Vertebra. The first fort come from the Medulla Oblongata, which has been already described, and they are ten Pair.

Nervi Olactorii.

The first Pair are called Nervi Offa-Storis; they arise from the Basis of the Corpora Striata, and passing through the little Holes of the Os Cribriforme, they are ollon

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of the the Os Spongiofum. The fecond are call'd Optici; they rife Opticis ney rus partly from the Extremities of the Corres, a pora Seriara, and partly from the Thalama of the Nervorum Opticorum, which last they al-fends most embrace; from thence approaching one another, they unite above the Cella Tircha, and immediately dividing again, they pals through the foremott-Holes of the Os Sphanoides into the Orbit, where piercing the Globe of the Eve,

> the glaffy Humour. The third are call'd Oculorum Motores ; Oculoru

they arise from the Medulla Oblongata on Motores. each fide of the Infundibulum, and the Carotidal Arteries lie between them; from thence passing through the Foramina Lacera of the Os Sphenoides, they give a Branch, which, with a Branch of the fifth Pair, forms a confiderable Plexus, which fends out feveral Twigs which embrace the Optick Nerve, and are spent on the Tunicles of the Eye: They give a Branch to the Muscles call'd Attollers, Deprimens, and Obliques Miner of the Globe.

their Medullary Fibres are spread upon

The fourth Pair are called Pathetiei, Pathetie they arise from a small Medullary Cord that is behind the Testes; they go down upon the fides of the Medulla Oblongata,

and

and passing under the Dura Mater by the fides of the Cella Turcica, they grow through the Foramina Lacera, and a wholly frent on the Obliques Major.

The fifth Dair.

ellis The fifth Pair rife from the fore par he T of the Processus Annularis; they are th liftril biggest Pair of the Brain; they gin he P Nerves to the Dura Mater; each of them divides into three branches, of which the naffe foremost is called Ramus Ophthalmica, Sbhan because it passes through the Foramen La Bran cerum into the Orbit, where it divide into two branches. The first fends out branch which joins a branch of the Motores, and forms the Plexus Opthalmicus, The rest of this first branch passes over the Globe of the Eye, gives some twigs to the Glandula Lachrymalis, and goes out at the Hole of the Os Frontis above the Circumference of the Orbit, where it is diffributed in the Skin and Frontal Muscles. The second branch of the Ramus Ophthalmicus goes under the Muscle Superbus, and passes out at the hole called Orbiter Internus, and is distributed in the Internal Nofe.

The fecond branch of the fifth Pair, which passes out at the third hole of the Os Sphenoides, divides into three branches, of which one pierces the hind fide of the Os Maxillare, and gives twigs to the Teeth of the Upper Jaw; all the

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to ie est of it comes out at the Hole in the oreside of the same Bone, under the Orit, and is distributed into the Cheeks and Nose. Another passes under the Prooffice Zygomaticus, and is distributed in the Temporal Muscle; and the third is distributed in the Palate and Muscles of the Pharynx.

The third branch of the fifth Pair passes through another Hole of the Os bhanoides, and then it divides into two Branches, the first of which is again divided into four Branches, of which the first passes between the Condyle and the Corone of the Lower-Taw to the Malle. The fecond is distributed in the Crotaphites. The third passes under the Processus Zygomaticus to the Buccinator, Glands of the Cheeks, and Upper-Lip. And the fourth passes from behind the Condyle of the Lower Taw, where it joins the Portio Dura over the Jaw, and is distributed in the Face. The second Branch is divided into three others. The first passes between the Pteri oideus E: ternus and the Internus; and towards the Angle of the Lower Jaw it fends out a branch which makes the Chorda Tympani, which goes also to the Muscles of the Malleolus, and then it joins the Portio Dura before it comes out of the Granium; the roll is spread on the Chin.

The second goes along the Sides of the hey in Tongue, and sends our several Branch. Bran which join the ninth Pair. It gives all form a fome Twigs to the Glandule Sublingual and for to the Muscles of the Tongue and (Regul Hyoides. The third goes to the Teel with of the Lower Taw by the Holes in in the P

The fixth Pair.

he The fixth Pair of Nerves rife from Pleur, the Sides of the Processus Annularity, This is a small Nerve which paffe of the straight through the Foramen Lacerum and and is wholly spent on the Musuclus Ab it diducens. But a little before it enters the the Orbit, it casts back a Branch which a the lone makes the Root of the Intercolla Ples Nerve. It passes out of the Skull by Ne the same Passage the Carotidale Arter enters. As foon as it is come out of the Skull, it, with a Branch of the tenth Pair, and of the first and second of the Vertebræ of the Neck, forms a large Plexus call'd Cervicalis. Below this, it receives a Branch made of a Twig of the tenth Pair, and of the first of the Neck. As it descends, above the Musculus Scalenus, and below the eighth Pair, it receives a Branch from each of the Vertebral Nerves. When it comes to the Clavicula, it divides into two Branches, of which one paffes above the Axillary Artery, and the other under it, and then they

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es of the hey immediately join again; they, with Branch of the first Pair of the Back, gives all form a pretty large Plexus at this place; dinguale and sometimes before (for it observes no and (Regularity) it casts out a Branch, which e Teet with a Branch of the eighth Pair, forms es in it he Plexus Cardiacus; then it goes down he Cavity of the Thorax, under the

fe from pleura, near the Vertebre, and as it paffes nnularit by, it receives a Branch from every Pair paffe of the Back, by which it grows bigger acerum and bigger. As it goes out of the Thorax. In A it divides into several Branches, of which ers the the three fuperior in the right Side form

nich a the Plexus Hepaticus, and in the left the recolla Plexus Splenicus. These Plexus's farnish all by Nerves to the Ridneys, to the Pancreas, to the Cawl, to the lower part of the Stomach, to the Spleen, to the Liver, to the Mesentery, to the Intestines; and their Branches form a large Net upon the

Mesenterick Arteries, call'd Plexus Mefentericus. The inferior Branches, as they go down upon the Vertebre of the Loins, receive a Branch from the first of the

Loins, and they fend out Branches which join those of the fuperior Baches which go to the Guts, and which forms

the Netupon the Mesenterick Arteries Then they go down into the Balon, and form a large Plexus above the fleaight

Gut to which it gives Nerves, as also rothe

the Bladder, Vesicule Seminales Prostate in o the Men, and to the Womb and Vagina in bove Women.

Nervus IS.

The feventh Pair is the Nervus Audi ary A Auditori- torius; it arises from the hind part of the verve Processus Annularis; it enters the Hole he A in the inner Process of the Os Petrosum; Aorta It divides into two Branches; that which each is faft is call'd Portio Mollis, and it is dis tary stributed into the Labyrinth Cochlea, and Muso Membranes which cover the Cavities of the of the Ear. That which is hard, is T call'd Portio Dura; it goes out of the gred Ear by that hole which is between the wo Proceffus Maftoides and Styloides ; it divides into two Branches, of which one goes to the Muscles of the Tongue, or Os Hyoides, and it gives a small Branch to the eighth Pair. The other is diffributed in the external Ear, Nofe, Lips, and Cheeks. d Cheeks. The eighth Pair is the Par Vagum; it

Par Vagum.

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rifes from the fides of the Medulla Oblongara, behind the Processus Annuleris, by feveral Threads which join together, and go out by the same hole that the Sinus Laterales discharge themselves into the Jugulares. It is joined by a branch of the Nervus Spinalis, or Accessorius Willifii, and by a small branch of the Portio Dura: Immediately after it comes out of the Skull, it gives a small Branch

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ate in the Larynx, as it goes down the Neck, ina in bove the Intercostal Nerve, by the side f the Internal Carotide. At the Axilary Artery it calls back the recurrent of the verves, of which the right embraces he Axillary Artery, and the left the ofum; forta. These two Branches ascend on which each fide of the Trachea Ameria to the is distance, where they are spent on the said Muscles of the Larynx and Membranes. wities of the Trachea.

Then the eighth Pair, after it has enred the Cavity of the Thorax, fends out wo Branches, which, with the Branches of the two Intercostals, form, a little ahove the Heart, between the Aorta and the Trachea, the Plexus Cardiacus, which gives a great number of small Branches to the Pericardium and Heart, particularly very many creep along the Aorta to the left Ventricle. The eighth Pair gives alfo feveral Branches to the Lungs, which accompanying the Bronchi, then it descends upon the Oefophagus, and is spread upon the Stomach, and some twigs go to the Concave fide of the Liver, as has been faid already.

With this Nerve it is usual to describe another which passes out of the Skull at the same hole with it. It is call'd Nervus Accessorius Willissi; it arises from the Medulla Spinalis, about the beginning of the

fixth

fixth Pair of the Neck; as it ascends the Head, it receives on each Side a Twi from the first five Pair of Nerves of the Neck, as they rife from the Medulla Spi O nalis; then it enters the Skull, and pal fes out of it again with the eighth Pair and is wholly spent upon the Museum TI monace later to entre conduction Trabezius.

The ninth Pair.

The ninth Pair rifes from the Proof hey fus Olivares of the Medulla Oblongata; passes out of the Skull by its own pronuat per Hole in the Os Occipitis; As it passes Med to the Tongue, it gives some Branches to the Muscles of the Os Hyvides, but in Trunk is distributed in the Body of the Tongue, and its Extremities from the Papilla Rotunda of the Tongue.

2 3 8000

The tenth Pair rifes by several small The tenth Threads from the beginning of the Ma dulla Spinalis; then accending a little, it goes out at the same Hole of the Dura Mater at which the Vertebral Artery enters, passing between the Protuberance of the Occiput and the first Vertebra, in the Sinus, which we have observed in this Vertebra: Then it gives a Branch to the first Pair of the Neck which goes to the Plexus Cervicalis; it gives another to the second Pair, and a third to the intercostal Nerve, and then it is all spent on the oblique Muscles of the Head. STATE OF THE PARTY 
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Of the Nerves which come out between ind pal the Verrebra.

all and came the sale is THE Nerves which come out be-Proof they arise from the Spinalis Medulla which ta; (as we have faid before) is a contin pro huation of the Substantia Medullaris, or passes Medulla Oblongara of the Brain, contain-inches ed in the great Holes of the Vertebra. out in Its internal Subtlance is mixed in several Places with a Substance like the Cortical Substance of the Brain, (as Malpighius has observed.) From the first Vertebra of the Neck to the first of the Loins, it is divided by the Pia Mater into the right and left Side, not quite through its middle, but the depth of a Line or two in its fore and hind part. From the first of the Loins to its Extremity, it is divided into a great number of Fibres, which separate from one another, if they be shaken in warm Water. This Part, because of its resemblance, is call'd Canda Equina, 'tis cover'd by four Membranes, of which the first is that which lines the great Holes of the Vertebra. The second is the Dura Mater, which has two Sinus's, one on each fide of the Medulla ;

dulla; they reach from the Occiput to the last of the Os Sacrum. The third is the Pia Mater: And the fourth, call'd Arabonides, is a very fine Membrane, which contains only the Bundles of Fibres which make the Vertebral Nerves.

All the Nerves, as they rife out of the Medulla Spinalis, are, by the Pia Mater divided into two Plans, which lie on above the other. And as foon as the Nerves are come out of the Vertebrathey fenda Branch to one another, when

they make a little Ganglio.

The Nerves of the Vertebræ are thing Pair, seven of the Neck, twelve of the Back, five of the Loins, and six of the Os Sacrum; they come out at the Hold in the sides of the Bodies of the Vertebra, which have been taken notice of in the Ofteology.

Of the Nerves of the Neck.

The first Pair of the Neck is spread in the Muscles of the Head and Neck; it joins a Branch of the tenth Pair, which goes to the Plexus Cervicalis, and it gives another Branch to the Intercostal Pair below the Plexus.

The second Pair of the Neck gives alfo Nerves to the Muscles of the Head and Neck, to the external Ear and Skin of the Face.

The third gives some Branches to the Neck and Head; it sends out the Nerum

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the runs iaphragmaticus, being joined by a Branch om the fourth Pair. This Nerve goes raight down the Cavity of the Thorax, d is spread on the Midriff.

The fourth, fifth, fixth and feventh, ve some Branches to the Muscles of the eck and Head; but their greatest Brannes, together with a Branch of the first the Back, enter the Arms. As foon as ey enter, they join all together, and en they immediately divide into five ranches. The first and innermost goes l to the Skin which covers the inner and re part of the Arm. The fecond goes own by the inner Protuberance of the umerus, by the Benders of the Fingers ; hd in the Palm of the Hand it divides nto five Branches, of which one goes to ach fide of the Little and Ring-Finger, nd the fifth to the external fide of the niddle Finger. The third accompanies he Artery between the Sublimis and the Profundus; it divides also into five branthes, of which one goes to each fide of he Thumb and Fore-finger, and the fifth to the Internal fide of the middle Finger. The fourth passes under the Biceps to the outer fide of the Arm, and Back of the Hand, to be distributed into the Fingers, as the foregoing. The fifth is spent on the Museles on the inside of the Arm. All these Nerves, except

Of the Nerves which come, &c. 354 the first give Branches to the Muscles

they pass by.

Of the Nerves of the Back.

The first Pair of the twelve Pair of Back gives a Branch (as is faid) tot Arms. The twelth Pair is dispersed the Muscles of the Lower Belly, a all the rest run along the Sinus in the der Side of each Rib, giving Nerves all the Muscles that lie upon the Ri and Vertebre.

Of the Nerves of the Loins.

The first and fecond Pair of the Loi give Nerves to the Muscles of the Low Belly, to the Inguen, to the Yard, a to the Parts contained in the Bason. The third and fourth give fome Branches the same Parts, but their Trunks in and make the Nervus Anterior Femo which is dispersed in the fore part the Thigh. This Nerve fends a Brand through the Hole in the Isthium, who is fpent in the Briceps. The last of the Loins, with a Branch of the fourth, a ter the Thigh.

Of the crum.

The Nerves of the Os Sacrum com Nerves of not out at the Holes on its backfide, but the Os Sa-at those in its foreside; and the last comes out between the Extremity of the Samm and the Os Coccigis.

The first four Pair of the Os Sacrum W give fome Twigs to the Parts in the fo Bason; but their great Branches, with the last, and a Branch of the fourth c of 500 41

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the Loins, make the Nervus Sciaticus, hich is the greatest Nerve in the whole dy. As this Nerve passes between e Gracilis Posterior and the Semi-memanofus, it gives a Branch to the Skin. hen it comes to the Ham, is divides in vo, of which one goes along the Perone the upper part of the Foot, and gives Branch to both Sides of each Toe. he other paffes under the Gemelli by ne inner Ankle, and is distributed in ke manner to the Toes in their under ides.

The fifth and fixth of the Os Sacrum ches he very small, they are dispersed in he Sphincter, and Bladder, and natual Parts.

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Of the Arteries in general.

wise advised only released

THE Arteries are Conical Channels, which convey the Blood from the Heart to all the Pants of the Body. Fig.

Coars, of which the first feems to be a Web of fine Blood Vessels and Nerves, in the for the nourishing of the Coats of the with Artery. The second is made up of Circular, or rather Spiral Fibres, of which there

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there are more or fewer Strata, accordi ood f to the bigness of the Artery. These y pre bres have a strong Elasticity, by wh rds, they contract themselves with some for when the Power by which they have be firetched out ceases. The third and most Coat is a fine, dense, transpare Membrane, which keeps the Blood will in its Channels, which otherwise, up the dilatation of the Artery, would ex ly separate the Spiral Fibres from o another. As the Arteries grow fmall and smaller, so these Coats grow thinne and the Coats of the Veins feem to only a continuation of the Coats of i Capillary Arteries.

cen The Structure of the Arteries bei thus premised, it will be easie to accoun for their Pulse. When the left Vent cle of the Heart contracts and throw its Blood into the Great Artery, th Blood in the Artery is not only thru forwards towards the Extremities, bu the Channel of the Artery is likewised lated; because Fluids, when they at preffed, prefs again to all hands, and their pressure is always perpendicular to the fides of the containing Veffels; but the Coats of the Artery, by any fmall impetus, may be diftended: Therefore, upon the Contraction of the Heart, the Blood

5 38 3 13 2 13 A.

Of the Arteries in general.

od from the Left Ventricle will not y press the Blood in the Artery forrds, but both together will diftend fides of the Artery. When the etus of the Blood against the fides of Artery ceases, that is, when the left ntricle ceases to contract, then the iral Fibres of the Artery, by their naal Elasticity, return again to their forr state, and contract the Channel of Artery, till it is again dilated by Systole of the Heart. This Diastole the Artery is call'd its Pulse, and the e the Spiral Fibres are returning to ir natural state, is the distance beeen two Pulses. This Pulse is in all Arteries of the Body at the fame ne; for whilst the Blood is thrust out the Heart into the Artery, the Artery ing full, the Blood must move in all Arteries at the same time; and beale the Arteries are Conical, and the ood moves from the Bafis of the Cone the Apex, therefore the Blood must ike against the fides of the Veffels, d confequently every point of the Arry must be dilated at the same time at the Blood is thrown out of the Left entricle of the Heart; and as foon as e Elasticity of the Spiral Fibres can vercome the impens of the Blood, the Arteries

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Of the Trunk of the Aorta, &c. Arteries are again contracted. The there are two Causes, which operation alternately, keep the Blood in a con nual Motion, viz. the Heart and Fibr of the Arteries: But because the is fironger than the other, therefor though the Blood runs continually. when an Artery is open'd it is feen move per Salum.

#### SECT. V.

Of the Trunk of the Aorta Ascendens.

AS all the Blood of the Body pall through the Heart, fo all is co veyed by the Branches of the Aorta, great Artery, to the feveral Parts the Body, in the Order we are now describe.

The Aorta coming from the left Ve tricle of the Heart, fends out two Bra ches call'd Coronaria to the Heart, befor it pierces the Pericardium; but after hath pierced it, it ascends a little, a then it crooks downwards and forms th Aorta Descendens. From the upper Sid of this Crook it fends out three Branches of two on the left Side which are one Sub clavian and one Carotide, one on the right Arrerics

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n the right The Arteriæ Subclaviæ on each Side send at the Mediastina, the Mammaria, the rvicalis or Vertebralis, and a Branch hich goes to the Muscles of the Neck, the Breast, and to the Glandulæ Thyides. After the Subclavia hath passed prough the Musculus Scalenus, it is call'd willaris.

The Arteria Carotides, as they ascend n each Side of the Trachea Arteria, give ome small Branches to the Trachea Artea, to the Larynx, to the Glandula Thyides, and then they send out each four onfiderable Branches.

The first goes to the Tongue, to the suscles of the Os Hyoides, and to the barrenx.

The second divides into two Branches, f which the first loses it self in the suscess Milobyoides and Digastrici, and the econd goes along the Basis of the low-r Jaw, and is lost in the Muscles of the Lips.

The third Branch divides at the Angle of the Lower Jaw into two Branches; one enters into the Lower Jaw, and the other makes the Arteria Temporalis.

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Of the Trunk of the Aorta, &c.

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The fourth Branch goes to the Mulch on the hind part of the Neck, and to the

Skin of the hind Head.

The Carotide then passes through the Canal in the Os Petrosum, gives some Branches to the Dura Mater, joins with the Cervicalis, sends out Branches to the Glandula Pinnitaria, Rete Mirabile, Plans Choroides, then it runs through all the Circumvolutions of the Cerebrum and Carebellum, and loses its Capillary Branche in their Carotidal Substance.

The Axillari, having pierced the Scalenum, gives some little Branches to the mearest Muscles; it sends out the The racica Superior and Inferior, the Scapularis, and then it gives a Branch which passes under the Head of the Human into the Musculus Longus and Brevis of

the Arm.

The Trunk of the Axillaris goes down the infide of the Arm, giving Branches by the way to the Muscles that lie upon the Humerus. Above the Elbow it sends out a Branch which is spread upon the Internal Condyle of the Humerus.

At the bending of the Elbow this same Brown
Trunk divides into two Branches, the one External, and the other Internal.

The External runs along the Radius, Diagit casts out a Branch which goes to the

Supinator,

See Supinator, and ascends to the Brachialis susceed Internus, in the rest of its course down to the other Wrist, it gives Branches to the Longus Rotundus, and Benders of the Fingers, Wrist and Thumb Being come for the Wrist, it sends out a Branch which is wit goes to the beginning of the Tenar, then to the passes under the Tendon of the Flexor Plo Pollicis; it gives Branches to the external to the part of the Hand, and passing under and C he Tendons of the Muscles, its Branches anche un along each fide of the Thumb and ore Finger.

The internal Branch goes down along he Cubitus to the Wrist, and is distribued in like manner to each fide of the Middle-finger, Ring-finger, and Little-

inger.

## SECT. VI.

## Of the Aorta Descendens.

ds out THE Aorta Descendens sends out first Inter- T the Bronchialis of M. Ruysch, which accompanies all the Branches of the sfame Bronchi. As it descends along the Verses, the abra of the Thorax, it sends out on each roal. If the Intercostal Arteries. To the Radius, Diaphragma it gives the Phrenica; and the TEN PRINTED & EVE CITY

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the Caliaca is the first it sends out when it enters the Abdomen. The Caliaca divides into two Branches, the one on the right, the other on the left, of which the first gives the Gastrica Destru which goe to the Stomach, the Cystica to the Gall Bladder, the Epiplois Destru to the Omen turn, the Intestinalis to the Intestine Durant, and to a part of the Jejunus the Gastro-Epiplois to the Stomach, to the Umentum, and some Branches to the Liver, which enter the Capsula Communication accompany the Branches of the Vin Porta.

The left Branch of the Calica gives the Gastrica Dextra, which is also spread the Stomach, the Epiplois Sinistra to the Omentum, and the Splenica to the Sub

stance of the Spleen.

Then the Aorta Descendens sends on the Mesenterica Superior, the Renales of Adiposa, which go to the Glandula Renales, and Fat about the Reins, the I mulgents to the Reins; the Spermatical the Testicles, the Lumbares Inseriores to the Muscles of the Loins, the Mesenterica Inserior, which with the Superior, it distributed through all the Mesenterium, and which accompanies all the Branches of the Vens Miseraica. When the Morta is come to the Os Sucrum

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it divides into two great Branches : and from the Angle they make, fprings out a small Artery call'd the Sacra, because it is spread upon the Os Sacrum. The Iliack Arteries divide again into the external and internal Iliacks.

From the internal Iliack arises the Hypogastrica, 'tis distributed to the Bladder, to the Restum, to the outer and inner fide of the Matrix, Vagina, Veficula Seminales, Proftata, and Penis, to the Os Sacrum, and to all the Parts contained in the Pelvis or Bason; then it gives two confiderable Branches which go out of the Lower Belly. The first paffes under the Pyriformis, and is diffributed to the Muscles call'd Glutei. The fecond, which is lower than the first, gives also two Branches pretty big, of which the first goes to the Obturatores, the fecond pierces the Cavity of the Abdomen, under the Pyriformis, and loses it felf by feveral Branches in the Glutens Major.

As foon as the external Iliack leaves the Cavity of the Abdomen, it sends out the Epigastrica, which runs up the infide of the Musculus Redus; and a little below that, the Pudenda, which goes to the Privities. Then it is called Cru-

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Of the Aorta Descendens.

ralis, which fends out three confiderable

The first is called Muscula, which gives several Branches. The first passes between the Muscles call'd Iliacus and Pettineus, and loses it self in the third Head of the Triceps in the Simi-membranosus or Semi-nervosus, in the beginning of the Biceps, in the Quadrugemin, and in the Cavity of the great Trochanter.

The second, third and sourth go to several parts of the Triceps and Gracilis Posterior.

Then the Trunk of the Muscula goes under the first of the Triceps, and divides

into three Branches more.

The first having pass'd the third of the Triceps, is lost in the Semi-membranofus. The second passes under the Femur to the Vastus Externus. The third goes a little lower, casts Branches to the Tendon of the third of the Triceps; it loses it self at the end of the Semi-nervosus, and at the end of the great Head of the Biceps.

The second considerable Branch of the Trunk of the Crural goes to the external part of the Thigh, passes under the Sartorius, under the Gracilis Restus; at casts some Branches to the end of the

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Iliacus, to the beginning of the Gracilis Rellus, to the Vaftus Externus, Cruralis, Membranofus, and fore part of the Gluteus minor. estation they desided about a design of

The third rifes almost from the same part of the Crural, and loses it self in the middle of the Gracilis Restus, Cruralis, and Vastus Externus.

The Crural having fent out thele three Branches, gives feveral Branches to the Sartorius, to the Gracilis Posterior, but the greatest goes to the Vastus Extermusing air that the same of a more anomalies

As the Crural descends, it finks the deeper in the hind part of the Thigh, passing through the Tendons of the Triceps: being come to the Ham, the first Branch it fends out is spread on the hind part of the Thigh Bone, and it goes to the little Head of the Biceps: then it casts out several other Branches, which lofe themselves in the Fat, and in the Extremities of the Muscles behind the Femur. Under the Ham it sends out two Poplitae, which go round the Knee, the one in the infide, the other in the outfide. It casts out, a little lower, several other Branches, of which some go to the beginning of the Gemini, of the Soleus Plantaris, and Poplitans, and the rest surround the Tibia on all fides. slower

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## Of the Aorta Descendens.

Then it divides into two Branches, of which the first passes through the Membrane which joins the Tibia and Perone together, upon which it continues its way, giving Branches to the Tibiens Externus, and to the Extensores Digital

The fecond Branch divides into two more, the one External, the other Internal.

The External, after it hath given Branches to the Solens, to the Peronem Posterior, and to the Flexor Pollicis, pierces the Membrane between the Tibia and Perone; rifes upon the external Ankle, to spread it self upon the upper part of the Foot.

The Internal, as it descends, gives Branches to the Solans, to the Flexores Digitorum, to the Tibiaus Posterior; then it passes by the Cavity of the Perons, where it divides into two Branches, of which one paffes under the Tenar to the great Toe, the other passes between the Musculus Brevis and the Hypotenut, and is distributed into the other three

This is the Order and Distribution of the principal Arteries in the Body, each of which are subdivided into others, and thefe again into others, till at laft the

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whole Body is over-spread with most minute Capillary Arteries, concerning which, there are two things remarkable. First, That the Branches which go off at any small distance from the Trunk of an Artery, unite their Canals into one Trunk again, whose Branches likewife communicate with one another, and with others, as before, By this means, when any small Artery is obfiructed, the Blood is brought by the communicating Branches to the Parts below the Obstruction, which must otherwise have been deprived of their Nourishment. These Inosculations are apparent every where, but chiefly in the Uterus, Mesentery, and Brain. It is the fame thing with the Veins.

The other thing is, That the Sum of the Orifices of the Branches of any Artery is greater than the Orifices of the Trunk from which they came; and upon this Confideration, the Velocity of the Blood is mightily diminished as it removes from the Heart. The Proportions the Primary Branches bear to one another, and the Aorta to the Cava and Pulmonary Artery, are as fol-

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Right Subclavian Artery	20101.0	there
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## SECT. VII.

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Of the Veins in general.

THE Veins are only a Continuation of the extreme Capillary Arteries, reflected back again towards the Heart, and uniting their Channels as they approach it, till at last they all form three large Veins, the Cava Defeendens whichbrings the Blood back from all the Parts above the Heart; The Cava Ascendens which brings the Blood from all the Parts below the Heart; and the Porta which carries the Blood to the Liver.

The Coats of the Veins are the same with those of the Arteries, only the Muscular Coat is as thin in all the Veinsy as it is in the Capillary Arteries; the preffure of the Blood against the fides of the Veins being less than that against the sides of the Arteries.

In the Veins there is no Pulse, because the Blood is thrown into them with a continued Stream, and because it moves from a narrow Channel to a wider.

The Capillary Veins unite with one another, as has been said of the Capillary Arteries. R 5 In

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In all the Veins which are perpen and b dicular to the Horizon, excepting those Auri of the Uterus and of the Porta, there are fmall Membranes or Valves; fome times there is only one, fometimes there are two, and fometimes three the placed together, like fo many half that Thimbles fluck to the fides of the Vein, vert with their Mouths towards the Heart Cava In the Motion of the Blood towards the Heart, they are preffed close to the fides of the Vein; but if Blood should it refall back, it must fill the Valver: and they being diffended, flop up the Channel, fo that no Blood can repair

### SECT. VIII.

of the Cava Descendens, or Superior.

LOR the more easie describing of the Veint, I shall begin at their Trunks, and proceed to their Branches contrary to the Motion of the Blood in them, and first of the Cava Defcendens, or that in which the Blood returns from all the Parts above the Heart.

The Trunk of the Cava Descendent joins the Trunk of the Cava Ascendent,

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erpen and both together open into the Right those Auricle of the Heart. On the infide of the Vein where the Trunks join. there is a finall Protuberance, which times hinders the Blood that comes from three the upper parts, from falling upon half that from the inferior parts, but difeart. Cava Descendens joins the Auricle; it rewards ceives the Coronary Vein of the Heart.

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o the As foon as it pierces the Pericardium, would it receives the Alux , or Vena fine Pari; this Vein runs along the right fide of the the Vertebra of the Thorax, and is made epail by the Union of the Veins of the Ribs on each fide. Its small end, at the Diaphragma, is divided into two Branches which communicate with a Vein, fometimes from the Emulgents. and fometimes from the Cava Afcondens.

> The Cava Descendens receives next the Intercostalis Superior, which is difirsbuted in the Interstices of the four first Ribs, to which the Awgos comes not. Remark, That the Branches both of the one and the other run in the Sinus's which are on the lower fides of the Ribs.

Sanmichellius hath observed, that the Trunk of the Cava Descendens receives

Of the Venæ Subclaviæ, &c.

a Branch call'd Pneumonica; 'tis this Branch which accompanies the Arteria Bronchialis of M. Ruyseb.

#### SECT. IX.

Of the Venæ Subclaviæ, Jugulares, and their Branches.

THE Trunk of the Cava Descendens, as soon as it comes to the Clavicula, where it is sustain'd by the Thymus, is divided into two Branches, the one goes to the right, the other to the lest; they are call'd Subclavia, which receive several other Branches.

The first is the Mammaria, which comes sometimes into the Cava, before it divides into the Subclaviæ; this Veinis distributed in the Breasts, and frequently it goes lower, and makes an Anafomosis with some Branches of the Epigastrica.

The second is the Mediastina, which is ordinarily one opening into the Trunk of the Cava; it goes to the Mediastinum and Thymus.

The third is the Cervicalis or Vertebralis, which goes up the Vertebra of the Neck, and casts some Branches by the by to the Medulla Spinalis.

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Of the Venæ Subclaviæ, &c.

The fourth is the Mufcula Inferior. which comes fometimes into the Jugulars; 'tis distributed through the inferior Muscles of the Neck, and the fuperior of the Breast. The Branch that answers this is call'd Muscula Posterior, because 'tis distributed in the Muscles which are in the hind part of the Neck.

After that the Rami Subclavii are come out of the Cavity of the Breaft, they are call'd Axillares; they receive the Scapularis Internus and Externus which goes to the Muscles of the Scapula, and to the Glands in the Arm-pits: Then they are divided into two Branches; the superior is call'd Cephalica, and the inferior Basilica.

Into the Bafilica open the Thoracica Superior, which goes to the Dugs and Muscles of the Breast. The Thoracica Inferior, which spreads it self upon the Side of the Breast, by several Branches which communicate by Anastomosis with the Branches of the Azygos, under the

Muscles of the Breast.

The Subclavii receive also the Jugulares Externi & Interni, which go to the Head.

The Jugulares Externi ascend towards the Ears, where they divide in two Branches,

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Branches, the one Internal, the other External. The internal goes to the Musicles of the Mouth and of the Other sides. The external lying upon the Parties, divide into two Branches, of which one is spread thro' all the Face, and the Branches of the one side unite with those on the other Side, and form the Vena Frontis: The other Branche goes to the Temples and hind Head.

The Jagulares Interni ascend to the Basis of the Cranium, where they are divided into two Branches, of which the greatest open into the Sinus Laterales of the Dura Mater, by the Holes throwhich the eighth Pair of Nerves come out; the least goes to the Pia Mater, by the Hole which is night the Cellar

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Of the Veins of the Arms and Hands.

THE Bafilica and Cephalica are the two principal Veins of the Arms and Hands.

The Cophalica creeps along the Arm between the Skin and the Muscles, it

divides into two Branches.

The external Branch goes down to the Wrist, where it joins the Lassica, and turns up to the Back of the Hand, where it gives a Branch which makes the Salvitella between the Ring Finger and the little Finger. The Ancients used to open this Vein in Diseases of the Head, in continued and intermitting Fevars; but the Moderns approve not of this particular Practice; since the Knowledge of the Circulation of the Blood, there is no difference whether one be Blooded in the Cephalica, Mediana, or Basilica.

The internal Branch of the Cephalica, together with a Branch of the Basilica,

makes the Mediana.

The.

Of the Veins of the Arms, &c; 376

The Bafilica, which is the inferior Branch of the Axillaris, divides into ius; three Branches, under the Tendon of Pollici the Musculus Pettoralis.

The first Branch accompanies the al, fourth Branch of Nerves that goes to ling

the Arm.

The fecond is called Profundua; it ore reaches below the Elbow, where it divides into two Branches; The one external, which goes to the Thumb, the fore Finger, and to the Musculi Extens goes to the middle Finger, to the Ring Finger, to the little Finger, and to the inner Muscles of the Hand.

The third Branch is called Subcutanews, towards the inner Condyle of the Arm; it divides into the Ramus Auto rior and Posterior; The first goes under the Muscles of the Ulna to the little Finger, where it joins a Branch of the Cepbalica; the second, near to the Elbow, sends out a Branch which goes to the Wrist; then it unites with the Cephalica Interior, and forms the Mediana.

The Mediana, which is made of the Cephalica Interior, and the fecond Branch of the Ramus Subcutaneus of the Basilica, divides into two Branches upon the Ra-

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Of the Trunk of the Cava. &c.

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Ralins ;

into lius; the one external, called Cephalica on of Pollicis, which runs between the Thumb nd the fore Finger. The other interes to inger and the middle Finger, and ometimes between this last and the it ore Finger.

## SECT. XI.

Of the Trunk of the Cava Ascendens, or Inferior.

THE Trunk of the Cava Ascendens, between the Heart and the Diabragma, does not lie upon the Vertebra, ut runs at a small Distance from them. It the Diaphragma it receives the Phreica or Diaphragmatica. When it has nder ierced the Diaphragma, it receives some arge Branches from the Liver; then he Cava Ascendens accompanies the great Artery from the Liver to the fourth Verebra of the Loins, where it divides ino two great Branches call'd Iliaci; but efore this Division, it receives four Branches from each Side.

The first is the Vena Adiposa, or Revalis, which is spread on the Coat and

fat that covers the Reins.

The

## Of the Trupk of the Cava, &c.

The second is the Vena Emulgent which goes to the Kidney, where it di vides into several more Branches.

The third is the Vena Spermatica, o

which we have already spoken.

The fourth is the Vena Lumbaris which is not always one, but often two or three on each fide, which they divide into superior and inferior; they are bestowed on the Muscles of the Loins, and on the Peritoneum. They sometimes call the last Branch of the Lumbaris, Muscula Superior.

There are some Anatomists that have observed, that there is a Branch of the Lumbaris that enters the Cavity, of the Vertebra, and which ascends to the Brain; which gave them occasion to think, against all probability, that the Seed descended by that Vein from the

Brain,

A little below the Emulgents, the great Artery goes above the Cava and then the Cava divides into two Branches call'd Iliaci, because the pass above the Ilia to go to the Thighs. Near this Division they to ceive one or two Branches call'd Ven Sacre; they go to the Medulia of the Sacrum,

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The

ulgent Then the Vena Hiera divide into o branches, the one Internal, the oer External. The Internal receives to branches, the Mufcula Media hich is spread through the Muscles the Thigh, the Hypogastrica, which so double, and spread and out the Sphinster of the Aum; therethe re 'tis call'd their Hemorrhoidalis the externa. The Hypogastrica is spread for the Bladder, the pop the Matrix and its Neck. pon the Matrix and its Neck.

The External Branch of the Iliace, have eccives three branches, two before is of the oes out of the Peritonaum, and the hird after it goes out of it.

hird after it goes out of it.

The fielt is the Vena Epigastrica. on to which comes rarely into the Cruralis, t goes to the Peritonaum, ascends to he Musculi Retti, where it rencounters he Mammaria, with which it communiates by Anastomosis.

The fecond is the Vina Pudenda; tis pread upon the Parts of Generation. The third is the Mufcula Inferior, it goes towards the Articulation of the Femur, and is distributed to the Muscles

of this Part.

The Iliaca Exterior, after it bath received all these branches, takes the Name Cruralis, and then receives fix branches more.

est. The first is the Vena Saphana, which goes down under the Skin along the infide of the Thigh and Leg, accompa nied with a Nerve which lofes it felf oon the inner Ankle. The Saphana turn ith towards the upper part of the Foot ofe where it gives several branches, which some go to the great Toe. oot.

The second is the Ischias Minor, thi Vein is little; 'tis spent on the Muscle and Skin which are about the upper

Toint of the Femur.

eg, The third is the Mulcula Externa because it goes to the External Mus cles of the Thigh. On the other fide of the Cruralis, just opposite to the beginning of this Vein, there goes out another call'd Muscula Interna, which goes to the Internal Muscles of the Thigh the desired to the tail the

The fourth is the Poplitua, made of two different branches united together; it goes fraight down by the Ham to the Heel; it lies pretty deep, upon which account it can hardly be open'd. The branches which appear in this place are

not of this Vein.

The fifth is the Suralis, which is pretty big, and which divides into two branches, the one External which is iver least, the other Internal which is big-

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eft. Each of these Branches divide which wain into two more; the one external, the other internal.

The Suralis distributes its Branches felts on the Ear of the Landers

turn ith the Branches To leg, and makes, Foot of Plexus of Veins which are con-icuous, on the upper part of the , thi oot.

The fixth and last Branch of the Cruuscle lis is the Ischias Major, which goes upper to the Muscles and Fat of the eg, and is divided afterwards into fethe Toes.

#### SECT. XII.

# Of the Vena Porta.

HUS we have described the Veins ther; e Body, except the Stomach, Spleen, the the ancreas, Omentum, and Intestines, from which hich Parts the Blood is carried by the Branches of the Porta to the Lice are it, to be returned by the Branches the Cava in the Liver, after that the ch is lie has been separated from it, (as a like the Cava in the Section of the two is been faid in the Section of the ch is iver.)

Of the Vena Porta.

The Vena Porta was fo gall'd by it Ancients, because they thought the vir. it brought the Chyle by its Meserai spreaments from the Intestines to the ment Liver, thro' whole Substance 'tis spres whi As it arises out of the Liver, it receive there two small Veins from the Vesica Fall'd Cystica Gemelle, one from the St Omet mach call'd Gastrica Dextra; then a make vancing a little to the Left, its Tru dalis divides into two Branches, of whi Bra the least, call'd Ramus Splenicus, go to the left Hypochondrium : And t greatest call'd Mesentericus goes to t yene Right. The Ramus Splenicus, fo call because it carries the Blood from Spleen, reecises two Branches call Gaftrica Minor, & Major, which a fline fpread through all the Stomach. Branch of the Gastrica Major makes t Coronaria Stomachice at the upper O fice of the Stomach. It receives the Branches more, two from the Omeni and Colon, and the third from the Pa

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Then the Splenicus divides into the Branches; the one superior, the oth infe rior.

The superior receives the Vas Box and some other Branches which con from the Spleen.

by the inferior receives two Branches, The interior receives two Branches, at the oil. The Epiplois Sinifira, which is deray spread thro' the back Part of the Otto to the mentum, and that Part of the Colon spread which is under the Scomach. The occeive ther Branch is the Gastro-Epiplois Sinification, which is also spread upon the season of the makes sometimes the Vena Hamorrhoi-Tru dalis Interna. The rest of this inferior while Branch comes from the Substance of the Spleen.

The right Branch of the Porta called divides.

The right Branch of the Porta called to the Vena Mesenterica, before it divides, receives the Gastro-Epiplois Dextra, which is spread in the Omentum and lower Part of the Stomach, as also the Interict a stick a stick a stick a standard the Jejunum; it receives some Branches from the Omentum and Pancress.

Then the Mesenterica divides into the Omentum and Pancress.

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Omen great Branches which run betwixt the Duplicature of the Mesenterium, two of them come from the right Side, which divide into fourteen Branches, e oth and these are again divided into an infinity of others less, which are call'd Meseraica; they creep upon the %junum, Ilium, Cecum, and part of the Colon.

The

The third and last Branch of the Vent Mesenterica, is spread thro' the mid dle of the Mesenterium, to that Par of the Colon which is on the lest Side to the Restum, down to the Annumber it forms the Hamorrhoidales Interna.

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## FINIS.

